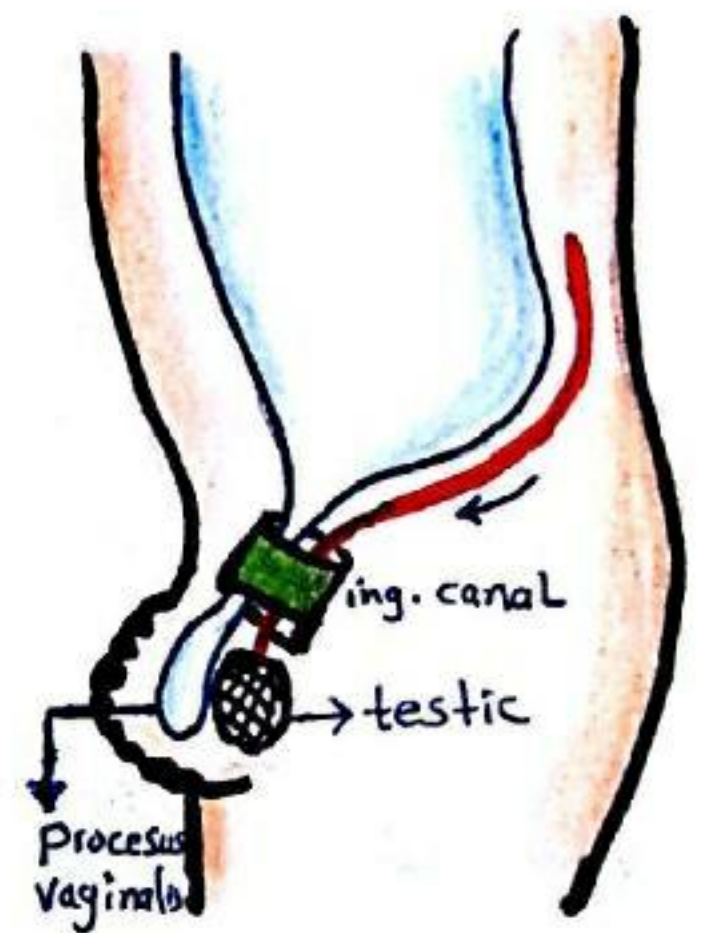


TESTES & SCROTUM

THE TESTES

* EMBRYOLOGY :-

- The testis develops from mesodermic genital ridge behind the peritoneum in lumbar region receiving blood & nerve supply high in abdomen.
- The testis descends downward forward & medially toward scrotum pulling its vessels, nerves & a fold of peritoneum (Processus vaginalis), the distal portion of processus vaginalis persists as tunica vaginalis.
- It starts descend at end of 8th week, reaching deep (int.) inguinal ring at 6th month, the superf. (ext.) ring at 8th month and the full descend to scrotum just before birth.
- The epididymis & vas deferens develop from mesonephric (Wolffian) duct
- The ^①Gubernaculum (fibromuscular band connecting testis to scrotum) is responsible for guiding testis to scrotum by its contraction helped by maternal ^{ch. gonadotropin} HCG & ^③faster growth of cranial segment of fetus than caudal segment.



- * Anomalies :-
- ① Malescence (imperfect descend)
 - undescended testis.
 - Ectopic " .
 - Retractable " .
 - ② agenesis (rare)
 - ③ supernumerary (rare).

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I- **UNDESCENDED TESTIS** :-

* Incidence :-

- about 1% of males ($\uparrow$ in premature infants)
- Defined : as arrest in normal pathway of descend. [usually ass. with hypospadias]
- More in Rt side _{50%}, 20% bilateral (Cryptorchidism) (hidden testis) _{مخفي}

* Aetiology :-

- ① Hormonal :- (Bilateral cases) :- due to $\downarrow$ HCG ^{testosterone} [$\downarrow$ androgen] _{or receptor not respond} so $\uparrow$ premature.
(the placental HCG secreted more in last week pregnancy)
- ② Mechanical :- (more in Unilateral) (anatomical causes) : as :-
 - Short gubernaculum (atrophied)
 - Short spermatic cord & vessels.
 - Stricture or stenosis of inguinal canal.

* Pathology :-

- the testis arrest anywhere along normal pathway $\rightarrow$ intraabdominal, in inguinal canal, superficial ring or neck of scrotum.

[NB] :- intraabdominal testis $\rightarrow$ depressed spermatogenesis, up to 2 years testis remains almost normal, then retardation of development due to high temp., at puberty $\rightarrow$ irreversible damage in germinal epith. if bilateral $\rightarrow$ sterility.

- on the other hand hormonal function of testis unaffected $\rightarrow$ normal 2^{ry} sexual character even if bilateral.

* Complications :-

$\rightarrow$ ST tumour, torsion, trauma

- ① - sterility (if bilateral) _(subfertility $\rightarrow$ unil.)
- ② - $\uparrow$ torsion testis _{15 times}
- ③ - $\uparrow$ malignancy risk _{35%} 50% (even after orchidopexy) (more high testis $\rightarrow$ $\uparrow$ risk of malign.)
- ④ - associated indirect ing. hernia ^{90%} (75% of pt)
- ⑤ - recurrent trauma (if inguinal) $\rightarrow$ atrophy.
- ⑥ - psychiatric disturbance.
- ⑦ - infection (NB orchitis always viral) (epididymo-orchitis)

* Clinical Picture :-

- Empty ^{undevolved} scrotum (uni- or biL.) discovered by neonatal exam. or by mother.

- * O/E :-
- start by normal side.
 - put your left hand on suprapubic area to abolish cremasteric reflex, start from neck of scrotum, then palpate inguinal canal → if not found examine for ectopic sites as sup. ing. pouch, femoral Δ , ^{root of penis} perineum.
 - if not found in ing. canal may be small under the ext. oblique aponeurosis → before lap. do reexam. under G.A (ms relax).
 - if intraabdominal best evaluated laparoscopic (retroperit.)
 - head raising test: → if in inguinal canal → testis disappear (under) if above ext. oblique → more prominent (ectopic)
 - confirmed by U/S

* D/D of empty scrotum :-

- | | |
|----------------------|--|
| ① ectopic testis | ④ testis agenesis. |
| ② undescended testis | ⑤ surgically removed (orchidectomy). |
| ③ retractile testis | ⑥ herma-phroditism. (in bil. cases).
(intersex) |

NB:- superficial ing. pouch :- is a pocket between Scarpa's fascia (deep membranous layer) & ext. oblique aponeurosis, adjacent to external ring. a common site for ectopic testis.

* Investigations :-

- 1) Hormonal assay (specially if bilateral with hypospadias) → LH, testosterone.
- 2) U/S, CT, MRI to localize testis if impalpable.
- 3) laparoscopy if intraabdominal → may be Dx + operative.
- angiography

* Treatment :-

- If testis donot descend within 6 months age unlikely to descend alone so do surgery befor or at 18 months (after 2yr → degenerated testis).

① Hormonal ttt:- by HCG → given for bilateral cases & if testis descend give small dose HCG [if testosterone ↑ means good prognosis] and give small dose testosterone to refresh testis & ↑ fertility
^{elongate cord}
(some do not recommend hormonal) (success rate vs surgery is 25%).

NB:- inhibin hormone is secreted from sertoli cells if present so testis is somewhere
NB:- give HCG to pt if testosterone ↑ so testis is present (but testosterone is secreted also by suprarenal)

② Surgery :- "Orchidopexy" [standard ttt].

- fixation of testis to scrotum. (through inguinal incision). ^{in dartos pouch (bet skin & dartos).}
- if very high do staged orchidopexy (some do not recommend staged orch. bec. post-operative fibrosis).

NB Indication of orchidopexy:-

success: 95%

- 1 - failed hormonal ttt.
- 2 - ectopic testis (when baby reach 6 months age).
- 3 - associated inguinal hernia.

- If old neglected case $\rightarrow$ ($>12y$) do orchidectomy.

some try to do orchid^{pexy} if failed $\rightarrow$ orchidectomy

if pt refuse orchidectomy $\rightarrow$ do orchidopexy [to diagnose changes as malignancy easily]

NB:- hormonal ttt dose is 500 IU of HCG every 5 days up to 6 wk
not given >5 doses (to avoid bone maturation) & contraind. if ectopic

NB:- orchidopexy doesnot $\downarrow$ risk of malignancy but early detection can be.
hormonal ttt done at 6m - especially if testis near to scrotum
also to facilitate descend.

II - ECTOPIC TESTIS :-

* Definition:- arrest of testis outside normal pathway. [after passing superf. ring]

* Aetiology:- may be caused by pull of an accessory gubernaculum.

- ectopic sites are
 - 1) superficial ing. pouch $\rightarrow$ commonest site.
 - above & lat. to pubic tubercle.
 - subcutaneous
 - 2) root of penis.
 - 3) femoral Δ .
 - 4) perineum (bet. anus & scrotum) $\rightarrow$ Painful on sitting.
 - 5) suprapubic area.
 - 6) contralateral scrotal compartment.

* Treatment:- orchidopexy or orchidectomy [no hormonal ttt].

III. RETRACTILE TESTIS :-

- Occurs in young children due to exaggerated cremastic reflex.
- It is not a disease as testis has descended normally to scrotum.
- Differentiated from undescended testis as the scrotum here is well developed & sometimes contains testis e.g. in squatting position "chair test" or "milking test".

- *Types:-**
- ① low retractile:- most of time testis at neck of scrotum
 - when drawn down to scrotum by milking test it stay there.
 - ② high retractile:- most of time in ing. canal (or ext. ring).
 - when drawn by milking doesn't stay (return)

NB:- cremastic muscle is not well developed in first 3 months of life so no retractile testis under 3 months of age
retractile testis never occur after puberty.

***Treatment:-**

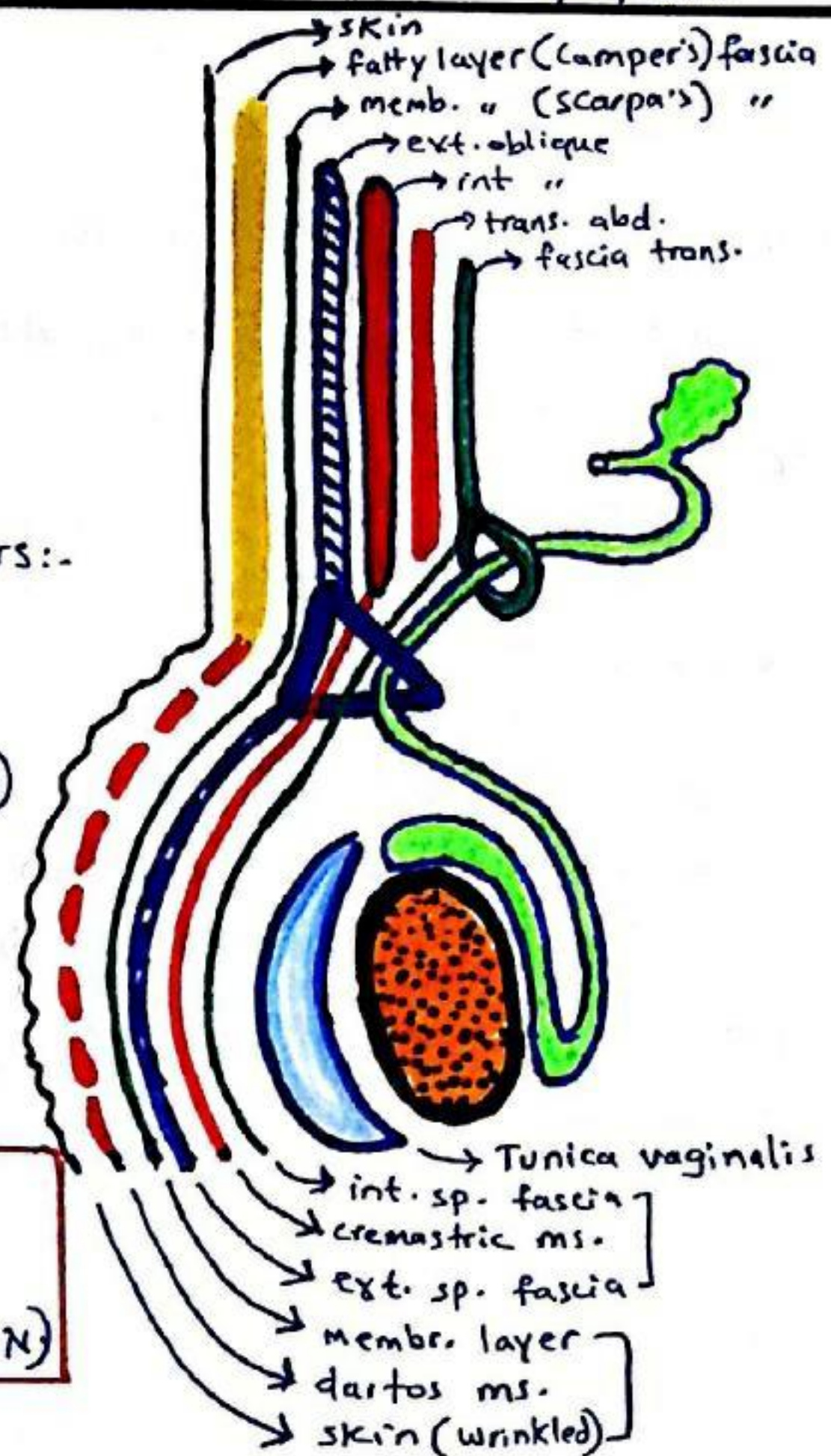
- usually no ~~ttt~~ as testis becomes heavier → not retractile
- Orchiopexy is done if ① high retractile ② small (atrophied) testis.

- the scrotum has the following layers:-

- 1- skin $\rightarrow$ wrinkled.
- 2- dartos ms. (replace fatty layer)
- 3- membr. layer (contin. of scarpia's fascia)
- 4- ext. spermatic fascia (" " ext. oblique)
- 5- cremasteric ms (from int. oblique).
- 6- int. sp. fascia (from fascia transv.).
- 7- tunica vaginalis (Parietal & visceral layer)

- Cremasteric ms is supplied by genital br. of genitofemoral N. (L1,2).

- dartus ms is smooth. muscle (autonomic N)



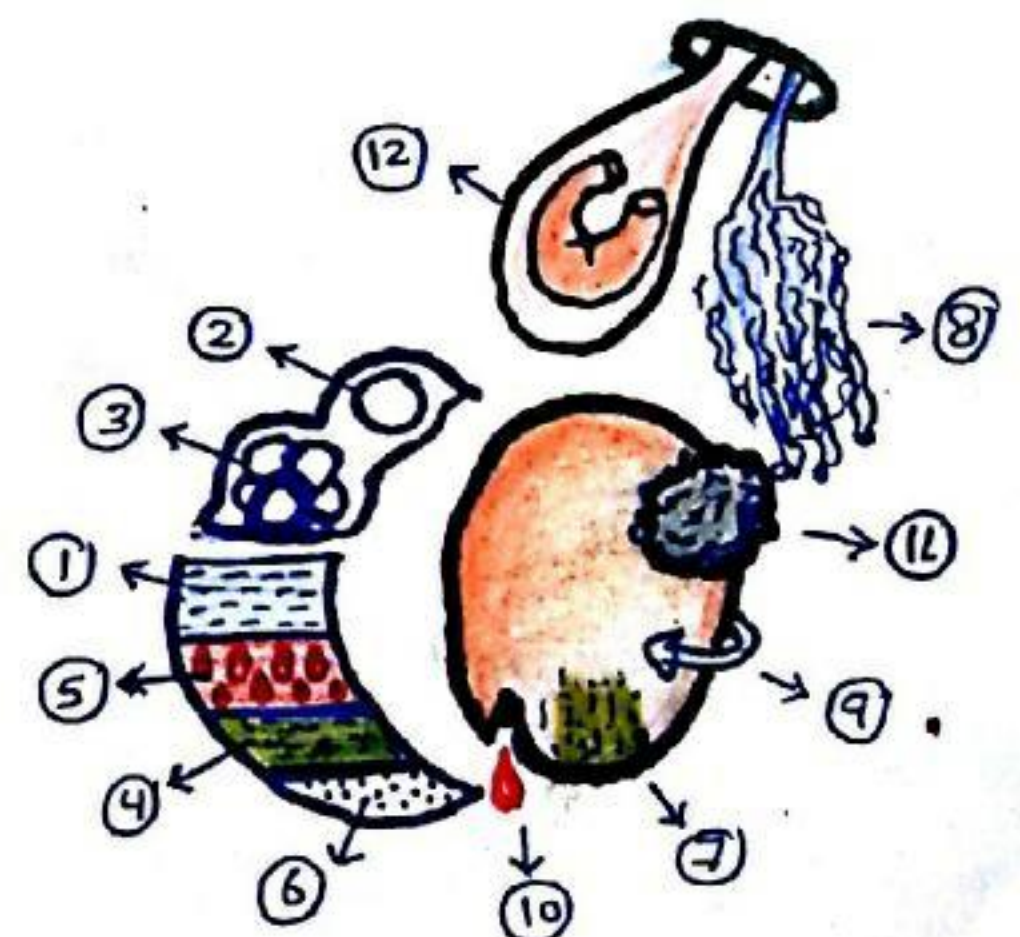
SCROTAL SWELLING

*Definition:- increase scrotal size due to $\uparrow$ it's content size. or fluids.

* Causes D/D :-

-
- ```
graph LR; subgraph Painless; P1[1 - hydrocele]; P2[2 - spermatocele]; P3[3 - simple epididymal cyst]; end; subgraph Pain; P4[4 - pyocele]; P5[5 - hematocele]; P6[6 - chylocele]; P7[7 - infection (epididymo-orchitis)]; P8[8 - varicocele]; P9[9 - Torsion testis]; P10[10 - Trauma to scrotum]; end;
```
- 1 - hydrocele  
2 - spermatocele  
3 - simple epididymal cyst  
4 - pyocele  
5 - hematocele  
6 - chylocele  
7 - infection (epididymo-orchitis)  
8 - varicocele  
9 - Torsion testis  
10 - Trauma to scrotum
- Painless
- Pain

- 11- Testicular tumour  $\rightarrow$  (90% Painless, 10% Painful)  
12- inguinal hernia  $\rightarrow$  (if reducible painless, if <sup>complicated</sup> obstructed painful)



NB:- Varicocele & hernia are inguinoscrotal swelling while the others are pure scrotal swelling.



# I. HYDROCELE

**\* Definition:-** <sup>abnormal</sup> Collection of serous fluid inside tunica vaginalis.

**\* Types:-** (1) Congenital<sup>(infantile)</sup>:- due to persistence of processus vaginalis  
 - occurs in 6% of full term babies.  
 - o/e it is reducible on lying down & you cannot <sup>testis palpable</sup> get above it on palpation. (↑ by crying ↓ by sleep)  
 - ttt:- <sup>no surgery before 1yr.</sup> Surgical ligation of processus vaginalis. (ing. incision)  
 (squeeze scrotum then ligate)

(2) Acquired: (A) Primary:- idiopathic (most common) = (vaginal hydrocele)  
 - due to imbalance of fluid secretion & absorption  
 - pure scrotal (can get above it), <sup>irreducible</sup> testis palpable  
 (B) Secondary:- due to infection, tumour, trauma.

**NB:-** Cong. encysted hydrocele of sp. cord:- due to persistence of the intermediate part of processus vaginalis. (usually inside ing. canal)

**NB:-** Hydrocel of canal of nuck:- is a similar condition occurs in a female in relation of round lig. of uterus.

## \* Investigations:-

- Scrotal u/s to see if there is an underlying cause in testis or epididymis, also see type & amount of fluid. (No semen analysis as not ass. w/ infertility)

## \* Clinical Picture:-

- middle aged & elderly male.
- Symptoms:- only scrotal swelling in primary, or s/s of cause in 2<sup>nd</sup> type.
  - Signs:- **T**emp. (no hotness), **T**enderness (no tenderness)  
**S**ite: & No. (scrotal uni- or bilateral) (but may be inguinoscr. if cong.)  
**S**ize (variable), **S**hape (usually oval), **S**urface (smooth),  
**S**kin over (normal), **C**onsistency (cystic), **E**dge (well defined)  
**S**pecial test (+ve transillumination test in 99% ~ in old<sup>lesion</sup> or complicated may -ve) (+ve fluctuation test)  
 - testis impalpable in 1<sup>st</sup> hydrocele & can get above it.  
 - Examine abdomen & do PR if 2<sup>nd</sup> hydrocele

**NB:-** In 1<sup>st</sup> hydrocele s/s develops slowly (chronic) → large size & tense.  
 - In 2<sup>nd</sup> " " " quickly (acute), usually not tense

1<sup>st</sup> (idiopathic) (vaginal) hydrocele is: pure, cystic scrotal swelling, translucent, painless with impalpable testis.



### \* Complications of vaginal hydrocele :- (infrequent)

- 1- infection → pyocele (usually after aspiration).
- 2- hemorrhage → hematocele (either by trauma or spontaneous)
- 3- rupture by trauma, herniation through dartos.
- 4- huge size → <sup>مذفون</sup>buried penis interfere with micturation & intercourse.  
"no infertility"

### \* Treatment :-

- Congenital hydrocele → ttt after 1 yr (if not closed spontaneously)
- Acquired hydrocele → ttt underlying cause.
- primary (vaginal)(adult) hydrocele → treated by surgery <sup>(hydrocelectomy)</sup> as follows:-
  - <sup>French (1860-1913)</sup> Jaboulay operation: ~~transperitoneal~~ → open all layers ~~but~~ <sup>sewn</sup> tunica vaginalis edges are <sup>(everted)</sup> together behind the spermatic cord.
  - Lord's operation: tunica is opened & plicated by series of stitches (each stitch from edge of cut to edge of the testis).
  - Excision of tunica: rarely done if large calcified tunica.

### NB:- Aspiration of fluid :- not done nowadays due to

it's complication as:-

- ① recurrence (100%) <sub>(after week or so)</sub> → can be avoided by inj. sclerotherapy to fuse 2 layers of tunica.
- ② Infection → can be avoided by a septic technique
- ③ Bleeding (hematocele) & trauma testis → u/s guide ~~avoid~~
- (NB) - sclerotherapy is contraindicated if patent processus vaginalis.

### NB:- D/D of cyst & palpable testis:-

- ① spermatocele → usually single, usually +ve transill.
- ② <sup>simple</sup> Epididymal cyst → usually <sup>locular</sup> multiple often bilateral
- ③ encysted hydrocele → usually in inguinal area <sub>of sp. cord.</sub>

Epididymal cyst is either ① simple epid. cyst → multilocular, clear fluid  
② spermatocele → milky (white) color fluid.



## IV

**VARICOCELE**

\* Definition:- elongation, dilatation & tortuosity of pampiniform plexus of veins (varicose veins of sp. cord).

\* Site:- usually unilateral, Lt side (95%) because:-

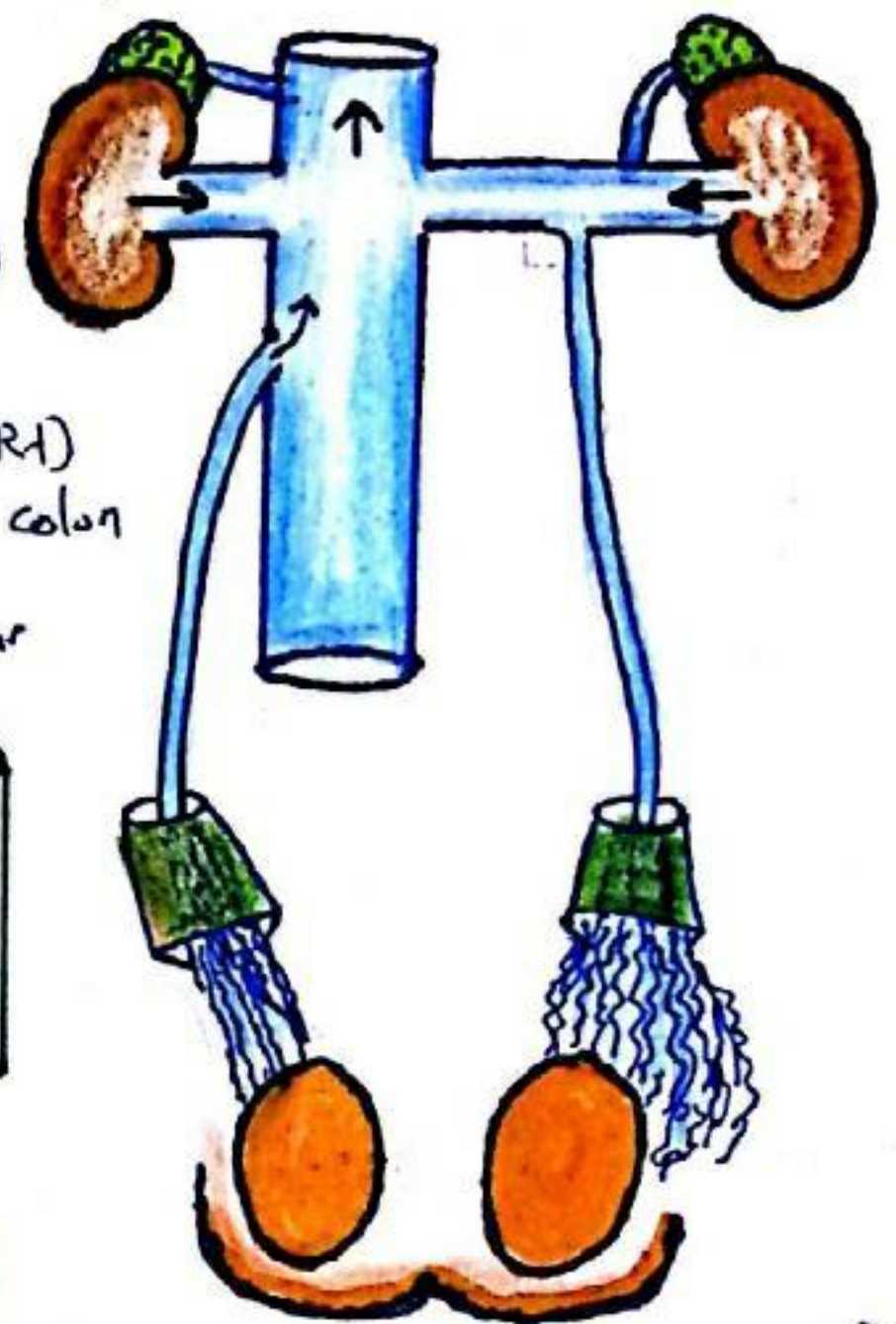
① Lt <sup>testicular</sup> ~~renal~~ vein drains by right angle to Lt renal vein (the right testicular to IVC by acute angle)

②- Lt vein longer course than Rt <sup>(lower testis lower than Rt)</sup>

③- Lt vein compressed by sigmoid colon

- pampiniform plexus are 4-8 veins that becomes 2 testicular vein after passing inguinal canal

NB:- Pampiniform plexus & testicular (Gonadal) vein are devoid of valves except at their ends



\* Types :- ① Primary varicocele :- (Reflux varicocele)

- Unknown aetiology (but may be due to weakness of vein wall or valve damage or weak mesenchyme)

- affect young adult (15-30 yr), 17-24%

② Secondary varicocele :- (obstructive):-

- due to obstruction of testicular vein by tumour, ascitis, fibrosis, pelvic mass.

NB:- rapid <sup>few wks</sup> developing varicocele in old pt with abd. mass highly suspicious of renal carcinoma.

\* Complications :-

① Subfertility (2% are infertile) due to ① higher temp. in scrotum by venous congestion affecting spermatogenesis (also ② mechanical compression of veins and ③ <sup>hormonal</sup> Lt adrenal hormones <sup>Ad & NAD</sup> → <sup>hypoischemia</sup> atrophy of testis)

② secondary hydrocele & thrombophlebitis.

\* Investigations :-

- Doppler or duplex scan → reversal blood flow in 1<sup>st</sup> varicocele (not in 2<sup>nd</sup>)
- semen analysis → <sup>abn. forms, motility</sup> ↓ sperm count & vitality (specially if bilateral)
- abdominal u/s if 2<sup>nd</sup> varicocele suspected → renal c.c. (hypernephroma)
- scrotal u/s for atrophic testis.

semen 2-5 >5 infection, <2 obstruction or wrong collection



\* Clinical Picture

- Usually a symptomatic, dragging sensation or aching pain specially on prolonged standing or hot weather.
  - may complain of infertility.
  - O/E :- hanging of scrotum (lower level), feeling of "bag of worms" or may be visible if large varicocele, cannot get above it.  $\pm$  atrophic testis
  - $\downarrow$  or disappear on lying down (but not  $\downarrow$  in secondary type)
  - in 2<sup>nd</sup> s/s of underlying cause.
- ↑ by Valsalva's maneuver.  
(no fluctuation test)  
(no transill. test)

\* Grades:

- Grade I :- not visible, palpable with Valsalva maneuver. [subclinical type].
- Grade II :- visible & palpable " " " [ " " ].
- Grade III :-  $\longrightarrow$  palpable without " " [on standing only]
- Grade IV :- visible & palpable " " " [on standing & lying  $\downarrow$  on lying down]

NB: 2<sup>nd</sup> varicocele palpable on standing & lying  $\bar{=}$  same degree

Grade I :- not seen, not palpable (only by Valsalva)  
 " II :- " " , palpable  $\uparrow$  by Valsalva  
 " III :- seen, " small sac  
 " IV :- " " medium sac  
 " V :- " " huge "

\* Treatment :-

- 2<sup>nd</sup> varicocele  $\longrightarrow$  treat underlying cause.
- 1<sup>st</sup> varicocele  $\longrightarrow$  varicocelectomy (laproscopic or open) or sclerotherapy
  - ① — open varicocelectomy either high or low ligation.
    - high ligation :- supra inguinal approach (above deep ring)
      - ligation of testicular vein (usually 2 veins retroperitoneal)
      - recurrence 25% (due to collaterals).
    - low ligation :- inguinal approach.
      - ligation of pampiniform plexus of veins.
      - recurrence 7%.
  - ② — sclerotherapy :- inj. of sclerosing agent into veins.

NB :- surgery indicated if infertility (absolute) or large painful varicocele  
 - mild cases with no infertility specially GI & II  $\rightarrow$  conservative as scrotal support, avoid constipation & long standing.

- ③ — laproscopic ligation of testicular vein is a modern ttt.
- ④ — Embolization of testicular vein is ttt of choice if recurrence.



## V - PYOCELE & CHYLOCELE:

- Pyocele:- (empyema):- collection of pus in the tunica vaginalis.
  - Caused by infected hydrocel & hematocele, post operative or secondary to supp. funiculo-epididymo-orchitis.
  - treated by incision & drainage, antibiotic, antipyretics, analgesia.
- Chylocele:- accumulation of lymph in the tunica vaginalis.
  - caused by rupture of lymph vessels in case of filariasis.
  - similar to hydrocele (but transill. test -ve).

## VI - TORSION TESTIS:

- \* Definition:- twisting of testis and epididymis around axis of sp. cord.
  - It is a surgical emergency, more in 10-25 yrs

### \* Aetiology (predisposing factors):-

- 1 - imperfect descend of testis (und. or ectopic).
  - 2 - Long mesorchium.
  - 3 - Capacious tunica vaginalis surrounding whole testis (clapper in bell)
  - 4 - spiral arrangement of cremasteric muscle.
- the existing cause usually a minor trauma or straining, but may be spontaneous at sleep.

### \* Clinical Picture:-

- Sudden pain (<sup>agonising</sup> severe) in scrotum, groin & lower abdomen ± vomiting.
  - O/E :- scrotum, tender, oedematous, red, testis higher than normal. (shock + ↑ Pulse rate, sweating may present)
  - D/D :- acute epididymo-orchitis → to differentiate elevate the scrotum
    - if pain ↓ epididymo-orchitis
    - if pain ↑ torsion "Prehn's sign".
- in epid. orchitis → gradual onset, dysuria.

### \* Investigations:-

- Urgent Doppler (obstructed flow), urgent duplex scan (if available)
- Exploration if doppler & duplex not available & suspected Dx.

NB: hanging up testis → torsion, hanging down → varicocele or tumour.



\* Treatment :- "send pt straight to surgery".

- Urgent exploration of scrotum, if testis viable do detorsion & orchidopexy, if gangrene do orchiectomy. (untwist)
- the opposite testis should be fixed at same time as predisposing factors are commonly bilateral.

### \* TORSION OF MORGAGNI APPENDIX TESTIS :-

- appendix testis is a vestigial remnant of Mullerian duct.
- torsion appendix testis presented in ~~ad~~ preadolescent males by tender upper pole of testis with blue dot on scrotal skin "blue dot sign" D/D  $\rightarrow$  torsion testis.
- ttt  $\rightarrow$  Immediate exploration (not differentiated from torsion testis) and do excision.

## VII: EPIDYDymo-ORCHITIS :-

- Inflammation of testis alone (orchitis) is rare, It is usually assoc. with inflammation of epididymis (epididymo-orchitis) or with the spermatic cord & epididymis (funiculo-epididymo-orchitis).

### \* Types :-

- ① acute epid.-orchitis
  - $\rightarrow$  Specific :- by bacteria causing STD e.g. <sup>chlamydia</sup> N. Gonorrhoea..
  - $\rightarrow$  Non specific :- bacteria (E. coli, strept... etc) or viral.
- ② Chronic epid. orchitis
  - $\rightarrow$  Non-specific :- following acute epid. orchitis
  - $\rightarrow$  specific :- e.g. TB,  $\Phi$  (syphilis),  $\Phi$  (Bilh), Filariasis

### Acute epididymo-orchitis :-

### \* Route of infection :-

- ① - Descending infection (common route) through vas deferens from urethritis, prostatitis, post operative, instrument.  
(Commonest organisms are gonococci, E. coli, proteus, strep., staph -- etc)
- ② - Blood born (rare) secondary to mumps.
- ③ - chemical epididymitis by urine reflux to vas  $\rightarrow$  epididymis.



### \* Clinical Picture :-

- Symptoms :- Fever, Anorexia, Headache, Malaise, (H/o prostatitis or... etc)
- severe scrotal & groin pain, dysuria
- signs :- tenderness, hotness, redness, swelling  $\pm$  2<sup>nd</sup> hydrocele.

### \* Investigations :-

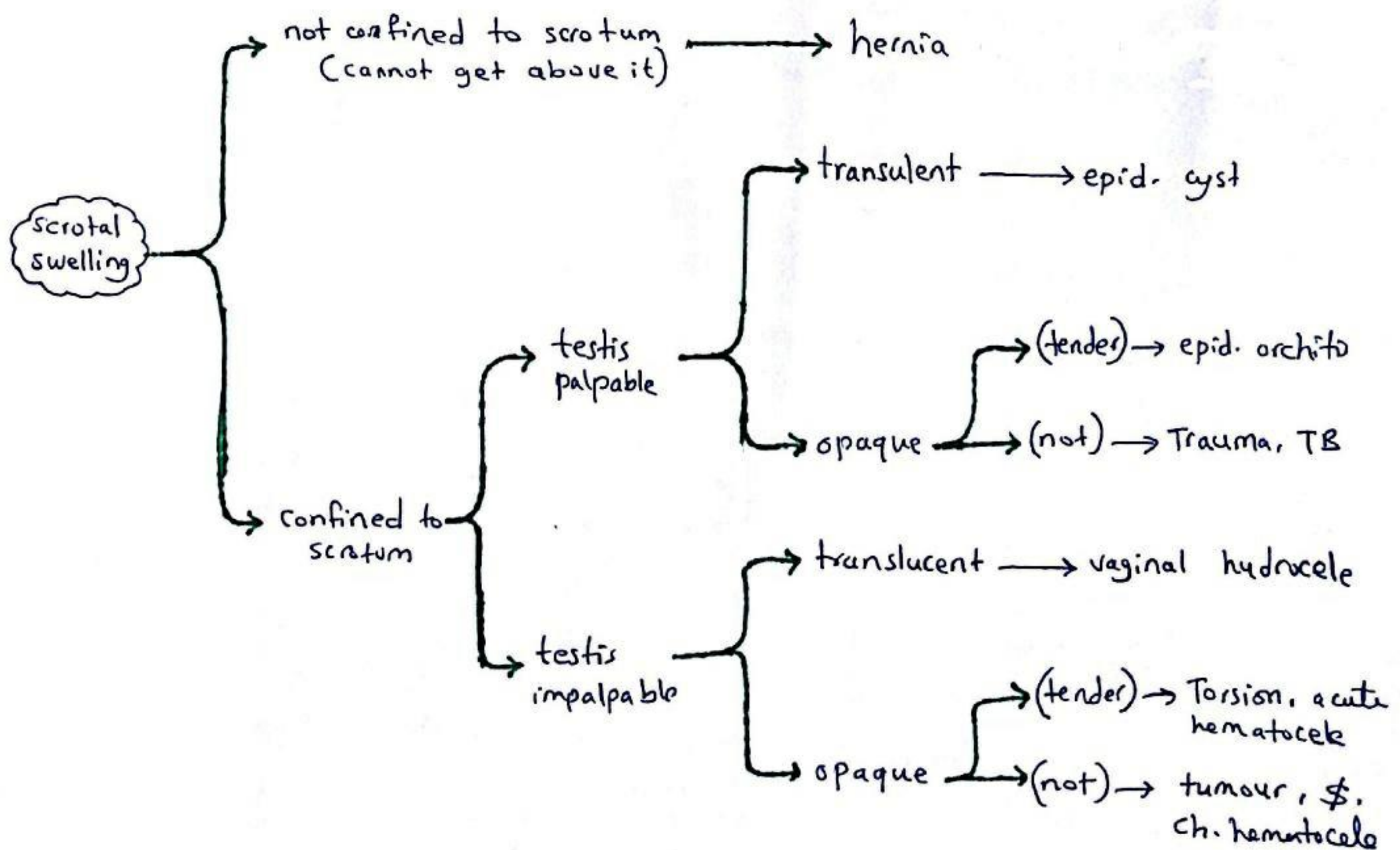
- CBC, ESR, c/s of urine & urethral discharge if present.

### \* Treatment :-

- Antibiotic [usually member of quinolones group] given 2-3 wks  
"residual epididymal mass may persist for 6 wks then resolve spontaneously"
- rest for first few days, drink plenty water.
- scrotal elevation (relieve pain unlike torsion ↑ pain), cold spongy, if pus mass & drainage, if doubtful Dx do exploration.

### \* D/D of epid. orchitis :-

- ① Orchitis :- in epididymorchitis pyrexia is higher, more redness & oedema.  
- orchitis is viral e.g following mumps parotitis in adolescent  
after 3-4 days it may → infertility in 30% of affected testis
- ② other causes of painful scrotal swelling as :- torsion, trauma, hematocele, strangulated hernia.





## VIII - TESTICULAR TUMOURS

### \* Incidence :-

- Common in young adult (18-30 yr) [seminoma > 30 yr, teratoma > 20]
- represents 1-2% of male malignant tumour. (rare) high social class
- more in **Rt** side, 1-2% bilateral.
- they are mainly malignant (99%).

### \* Aetiology :-

- maldescended testis especially intraabdominal variety.

(10% of pt with testicular tumour have H/O undescended testis)

- they are more common in high social class.

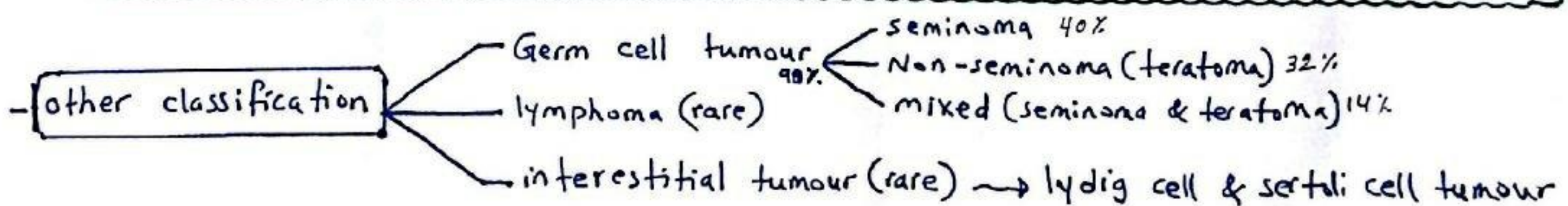
### \* Pathology :-

- about 90-95% of testicular tumours are germ cell tumours which are divided into :-

① Seminoma → represents 50%.

② Non seminoma → [teratoma (30%), others (20%) → choriocarcinoma, mixed tumour, lydig cells, sertoli cells, gonadoblastoma.]

**NB:-** important to ask pt about H/O undescended, infertility, previous test tumor  
- lymph. drainage of testis to paraortic LN but scrotum to ing. LN.



• **Spread :-** Direct :- to epididymis, tunica, spermatic cord, ... etc.

Lymph :- to paraortic LN, iliac LN, mediastinal LN.

blood :- to <sup>(mainly)</sup> Lung, Liver, bone & brain.

• **staging :-** **T<sub>1</sub>** :- tumour in testis

**T<sub>2</sub>** :- not outside tunica vaginalis (T. albuginea)

**T<sub>3</sub>** :- outside " " (epididymis)

**T<sub>4</sub>** :- spermatic cord is involved

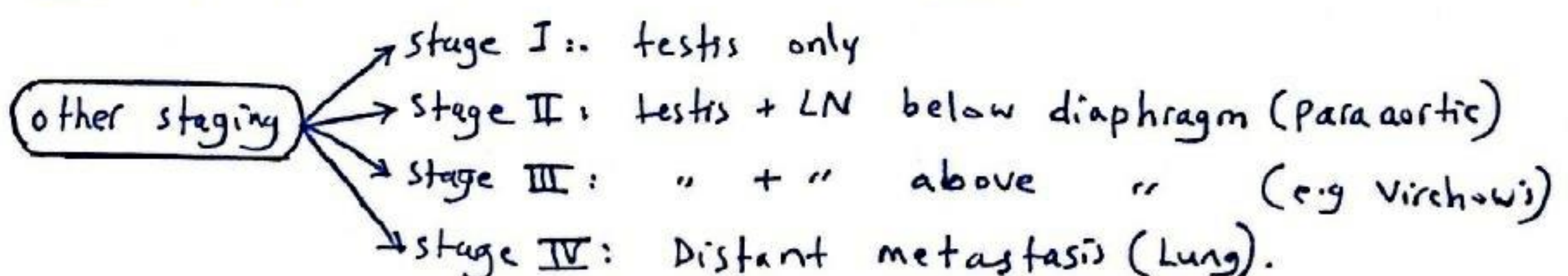
**N<sub>1</sub>** :- LN < 2cm

**N<sub>2</sub>** :- LN 2-5cm

**N<sub>3</sub>** :- LN > 5cm

**M<sub>0</sub>** → no metastasis

**M<sub>1</sub>** → distant metastasis



**NB:-** Generally test. cancer has good prognosis → 5 yr survival is 95%.



|               | SEMINOMA (commonest)                                                                                                                                                                                                                                   | TERATOMA                                                                                                                                                                                                                                                                                                                           |
|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Origin        | from seminiferous tubule                                                                                                                                                                                                                               | from embryonic totipotent cells <sup>gives rise to</sup>                                                                                                                                                                                                                                                                           |
| Age           | 30-45, usually unilateral                                                                                                                                                                                                                              | 20-35 yrs.                                                                                                                                                                                                                                                                                                                         |
| Growth        | slow, low malignancy                                                                                                                                                                                                                                   | rapid, higher malignancy.                                                                                                                                                                                                                                                                                                          |
| Irradiation   | radio-sensitive [better prognosis]                                                                                                                                                                                                                     | • radio-resistant [bad prognosis]                                                                                                                                                                                                                                                                                                  |
| Spread        | mainly lymphatic (Para-aortic)                                                                                                                                                                                                                         | Mainly blood (lung)                                                                                                                                                                                                                                                                                                                |
| Micro-        | <ul style="list-style-type: none"> <li>round cells w/ clear cytoplasm, fibrous cells arranged in sheets. ↓ acidophilic cytoplasm [resemble spermatocytes]</li> <li>large nuclei, fibrous + lymphocyte infiltration (suggest good prognosis)</li> </ul> | <ul style="list-style-type: none"> <li>① Teratoma Differentiated (TD) dermoid cyst</li> <li>② Malignant teratoma <sup>intermediate</sup> differentiated (MTI) (most common)</li> <li>③ Malignant teratoma anaplastica (MTA)</li> <li>④ Malignant teratoma Trophoblastica (MTT) was known as chorio-ca. (most malignant)</li> </ul> |
| Macro         | <ul style="list-style-type: none"> <li>irregular homogenous pink w/ areas of Hge, necrosis &amp; fibrous septa</li> </ul>                                                                                                                              | <ul style="list-style-type: none"> <li>heterogenous, multicystic mass</li> <li>area of Hge &amp; necrosis</li> </ul>                                                                                                                                                                                                               |
| Tumour marker | <ul style="list-style-type: none"> <li>HCG produced by 5-10% of seminomas (No pure seminoma producing <math>\alpha</math>FP)</li> </ul>                                                                                                                | <ul style="list-style-type: none"> <li>HCG produced by 100% of MTT</li> <li><math>\alpha</math>FP " " MTA 40-60% of MTA</li> </ul>                                                                                                                                                                                                 |

\* Tumour markers :- ①  $\alpha$  fetal protein ( $\alpha$ FP) :- produced by yolk sac tumour.

② LDH :-  $\longrightarrow$  advanced tumor size.

③ HCG  $\longrightarrow$  Seminoma & teratoma.

④ PAP (placental alkaline phosphatase)  $\longrightarrow$  placental tumour.

**NB:-** HCG :- secreted by syncytiotrophoblast :- (N. < 5 mIU/ml)  
 $\uparrow$  in all choriocarcinoma MTT, 40-60% of MTA, 5-10% of pure seminoma  
 $\alpha$ -FP :- by fetal yolk sac & trophoblast  
 $\uparrow$  in 50-70% of non seminoma, not produced by pure seminoma or choriocarcinoma.

\* Clinical Picture :-

- Painless scrotal swelling with discomfort & heaviness sensation  $\pm$  hematocele or hydrocele  
 about 10% are painful

- NB:- general s/s as wt loss, anemia are rare,

- may be presented by 2ry (lung  $\rightarrow$  hemoptysis)  $\longrightarrow$  occult carcinoma.



\* Investigations :-

- Scrotal U/S , (biopsy in doubtful cases  $\rightarrow$  excisional biopsy) <sup>(not scrotal)  
via inguinal</sup>
- Tumour marker , CBC , U/E/C
- Chest x-ray , U/S & CT of abdomen (LN & liver deposits)

\* Treatment :-

① Initial tt by high orchidectomy via inguinal incision (before testis manipulation do vascular clamp as high as possible in spermatic cord)  $\rightarrow$  if surgeon is in doubt, biopsy is taken for frozen section examination.

NB - before tt do semen banking.

- Scrotal incision is contraindicated as it opens a way for spread to inguinal LN.

② further tt depends on type & stage of the disease:-

- Seminoma  $\rightarrow$  radiotherapy to LN "para-aortic"  
chemotherapy if M<sub>1</sub> (2 cycles)
- Teratoma  $\rightarrow$  chemotherapy (2 courses)

[if no LN  $\rightarrow$  no radiotherapy  
just follow by CT & tumour marker]



# PROSTATE ENLARG.

- ① Benign prostatic hyperplasia (BPH).
- ② Cancer prostate.
- ③ prostatitis (acute & chronic).

## I - BPH or Senile Enlargement of Prostate = SEP.

### \* Incidence :-

- Starts at 40 years [ by age of 50 yrs about 50% of males have BPH.

### \* Aetiology: → unknown.

has low mortality & morbidity.

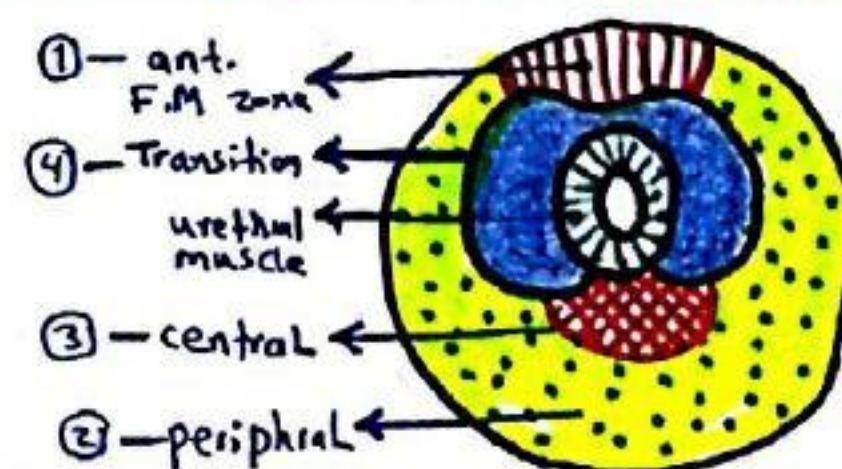
- ① Hormonal imbalance :- (most accepted) → imbalance between androgens and estrogens due to aging.
- ② Neoplastic theory :- BPH believed to be a benign neoplasm (fibro - myo - adenoma), NB :- BPH is not precancerous

### \* Pathology :-

- Macroscopic :- BPH affects median and/or lateral lobes or the three lobes affected "trilobar". with false capsule (compressed tissue)
- Micro :- hyperplasia of glandular, fibrous & muscular elements mainly around urethra → stromal nodules

NB :- the prostate is not divided into lobes but is actually into zones :-

- ① Anterior fibromuscular zone
- ② peripheral zone → (cancer arise here)
- ③ central zone
- ④ Transition zone (periurethral) → (BPH arise here)



BPH central & cancer peripheral.

### \* Patho Physiology :- (effect) :-

- ① on urethra :- elongated, narrow.
- exaggeration of normal posterior curve.



## ②. on bladder:-

- muscles of bladder (detrusor) undergo hypertrophy to overcome obstruction → trabeculation → herniation of mucosa → diverticulum
- later ms atony → residual urine
- projection of middle into bladder → post prostatic pouch → residual urine + stone & infection
- enlarged BPH → compress prostatic venous plexus → vesical piles → hematuria.



## ③. on ureter &amp; kidneys:-

- hydro~~ure~~ter & hydronephrosis, UTI → pyonephrosis

## ④. on sexual organs:-

- early BPH ↑↑ libido & later may → impotence.

\* Clinical Picture :-

- (no correlation bet. size of BPH & S/S, but on degree of obstruction)
- may be asymptomatic.

## A. Uncomplicated cases:-

- 1- Hesitancy [as difficult start by ↑ congestion due to straining]. pt has to relax seconds to start
- 2- Frequency ~~~~~→ 2<sup>st</sup> symptom.
- 3- Urgency ~~~~~→ 1<sup>st</sup> symptom (at first nocturnal)
- 4- weak, interrupted stream.
- 5- post-micturition stripping "detrusor failure", urge & overflow incontinence. dysuria

urgency = sudden, compelling urge to urinate

## B. Complicated cases:-

- 1- acute urine retention <sup>painful</sup> (may be 1<sup>st</sup> presentation) → congested neck, infection ... etc
- 2- chronic urine retention painless
- 3- hematuria, cystitis, stones, CRF, impotence, ... etc.

urine retention = (ischuria) = lack of ability to urinate

NB:- causes of frequency in BPH are:-

- 1- incomplete bladder emptying.
- 2- excitability of hypertrophied detrusor. (bladder instability)
- 3- complications as cystitis, diverticulum.

NB:- on P/R exam. → enlarged gland, smooth & firm with mobile rectal mucosa over it (cancer irregular, hard, fixed mucosa).



## \* Investigation

- 1- routine lab. test :- CBC, urine analysis, U/E/C.
- 2- Serum PSA (prostatic specific Ag) to exclude cancer (N. 0-4 ng/ml).
- 3- Flowmetry  $\rightarrow$  (maximum flow-rate  $< 15$  ml/sec indicate obstruction)
- 4 - Urodynamic study best method but expensive & not available.
- 5- Radiological :-
  - U/S abdomen  $\rightarrow$  residual urine  $> 100$  ml is significant,  $\rightarrow$  see kidney, bladder, ... etc
  - Trans-Rectal U/S (TRUS)  $\rightarrow$  assess size & may take <sup>8-12</sup> biobly. [see if homog. or heterog. if  $\uparrow$  PSA]
  - IVU (I.V urography)  $\rightarrow$  kidney function, hydronephrosis & ureter ... etc

NB:- biobly can taken by  $\rightarrow$  TRUS (transrectal U/S)  $\rightarrow$  commonest  
 : Transurethral (TURP)  $\rightarrow$  used in resection  
 : Transperineal (perineum)  $\rightarrow$  if abnormality in urethra or rectum

## \* Treatment:-

### (A) Retention treatment:

- Pass a catheter, if difficult do suprapubic catheter.
- decompress the bladder slowly (to avoid hematuria & hypotension).

### (B) Medical treatment:-

(for mild cases, unfit pt, & pt who hasn't completed his family).

#### (1) $\alpha_1$ -blockers :- e.g Prazocin, also omnic (selective $\alpha_{1A}$ blocker).

- they block  $\alpha_1$  adrenergic receptors in prostatic smooth ms & capsule  $\rightarrow$  relaxation of ms  $\rightarrow$   $\downarrow$  urethral compression. (3mg twice for life)
- they doesnot  $\downarrow$  prostate size but improve flow.
- omnic S/E is orthostatic hypotension, It usually  $\uparrow$  line bec less S/E.

#### (2) 5- $\alpha$ reductase inhibitor:- (Proscar = finasteride)

- It inhibits conversion of testosterone into DHT (dihydro testosterone).
- It improve symptoms &  $\downarrow$  size by  $\approx 30\%$ .
- proscar S/E are  $\downarrow$  lipids,  $\downarrow$  ejaculatory volume, impotence

once daily for 6m then stop 2-3m & another course given for shorter duration

NB:- in BPH if epithelial element  $\rightarrow$  give proscar  
 if stromal element  $\rightarrow$  give omnic

### (C) surgical $\uparrow$ :-

- indicated in :-
- acute & ch. urine retention, hematuria.
  - stone in bladder, ~~case~~ diverticulae.
  - sever obstructive symptoms.
  - recurrent UTI



- Idea of surgery (to remove adenomatous enlargement).

- types of surgery in BPH are :-

① - closed surgery (endoscopic) :-

① TURP (Trans-Urethral Resection of Prostate)  $\rightarrow$  "Gold standard"

- using cysto-resectoscope removes adenoma transurethral piece by piece using electrocautery  $\rightarrow$  send to histopathology.

- the only limitation is a large adenoma  $\rightarrow$  making the procedure lengthy & hazardous.

② TULP (Transurethral Laser ablation of prostate) :-

<sup>adv</sup> - [less bleeding than TURP] <sup>less TURP syndrome</sup> but <sup>done opp</sup> [cannot take biopsy & long time catheter] <sup>high cost, prolonged irritative SIS</sup>

③ Transurethral heat vaporization, balloon, stent  $\rightarrow$  not done.

② - open surgery (prostatectomy) :-

- used with large gland ( $>80$  g), if associated  $\bar{e}$  bladder stone, diverticulum.

① - Transvesical prostatectomy  $\rightarrow$  done if associated bladder pathology.

② - Retropubic (Millin's) prostatectomy  $\rightarrow$  via retropubic space (cave of Retzius)

### \* Complications of Prostatectomy :-

- 1- Bleeding (the main problem), clot retention may occur.
- 2- Retrograde ejaculation due to damage of int. sphincter. (in  $>90\%$  of cases)
- 3- Infection  $\rightarrow$  urethritis, cystitis, ... etc.
- 4- Bladder neck stricture (fibrosis), urethral stricture.
- 5- Impotence in 2-5% due to pudendal N. injury.
- 6- Incontinence in 1:10000 by sphincter damage.
- 7- TURP syndrome :- occurs in TURP due to over absorption of irrigating hypotonic fluid used during endoscopy, characterized by hypervolemia, dilutional hyponatremia & intravascular hemolysis  
- use of glycine (isotonic) for irrigation avoid TURP syndrome  
(if procedure lasts  $>2$  hr also glycine absorbed)
- 8- CV & respiratory problems & death. in 0.2-0.5%.

NB American urology society symptom score (Glascow score)  $\rightarrow$

0-7 watch & follow up  
7-18 medical ttt  
18-35 surgical

|                  | 0 | 1 | 2 | 3 | 4 | 5 |
|------------------|---|---|---|---|---|---|
| dysuria          |   |   |   |   |   |   |
| freq.            |   |   |   |   |   |   |
| nocturia         |   |   |   |   |   |   |
| urgency          |   |   |   |   |   |   |
| hesitancy        |   |   |   |   |   |   |
| weak stream      |   |   |   |   |   |   |
| incomplete empty |   |   |   |   |   |   |



## II CANCER PROSTATE

Man-Killer



### \* Incidence:.

- the commonest cancer in male
- the 2<sup>nd</sup> most common cause of death (after bronchogenic ca.).
- affect old male > 6 yr [35% of people > 90 yr have pr. ca at autopsy]

- risk of developing histological ca is 30% in 50 yr old.
- " " " " " 70% " 80 yr " .
- " " " clinical " " 10% .
- " " dying from cancer is 3%

د. عبد الحفيظ منصور

### \* Aetiology: (risk factors)

- ① age → (strongest) → in USA black > white.
- ② Race → higher in North America & Europe (lower in far east → china, japan)
- ③ Diet → ↑ fat diet & red meat (NB:- B-caroten "vit-A" protect again pr. cancer, Asian diet rich in vit-A) (NB: fat ↓ vit-A absorption)
- ④ genetic → in 9% of cases, risk ↑ 2-3 times in 1<sup>st</sup> degree relatives.
- ⑤ environment exposure to heavy metals e.g. cadmium, radiation and high level of U/V

(NB:- cancer prostate not occurring in castrated people (removing testes))

### \* Pathology:.

- Macro:- 75% of <sup>patients</sup> cancer arise in peripheral zone, more in posterior lobe, hard irregular nodule ± areas of Hge & necrosis
- Micro:- 95% are adenoca., 5% others (89% Transitional cell ca TCC, and 15% neuroendocrinal tumour). with malignant cell characters.

PIT (prostatic intraepithelial neoplasm):-  
have signs of cancer without destructing basement membrane

- Grading:- I - well differentiated  
II - moderate.  
III: poorly " IV - anaplastic.

Gleason Grading:- based on degree of glandular diff. & growth pattern  
Grade 2 is least malignant, 10 is most malignant  
GI = 2-4    GII = 5-7    GIII = 8-10







## • Staging :- "TNM staging"

**T<sub>1</sub>** - impalpable, not detected by U/S, accidentally discovered.

T<sub>1a</sub> = Dx by TURP <5% of tissue resected.

T<sub>1b</sub> = " " " >5% " " " "

T<sub>1c</sub> = " " needle biopsy (bec. elevated PSA).

regular capsule ← **T<sub>2</sub>** - palpable, confined to prostate

irregular ← **T<sub>3</sub>** - locally extensive (seminal vesicle, capsule<sup>T<sub>3b</sub></sup> invasion)

**T<sub>4</sub>** - fixed to neighbouring organs (pelvis).

**N<sub>0</sub>** → no regional LN.

**N<sub>1</sub>** → to regional LN.

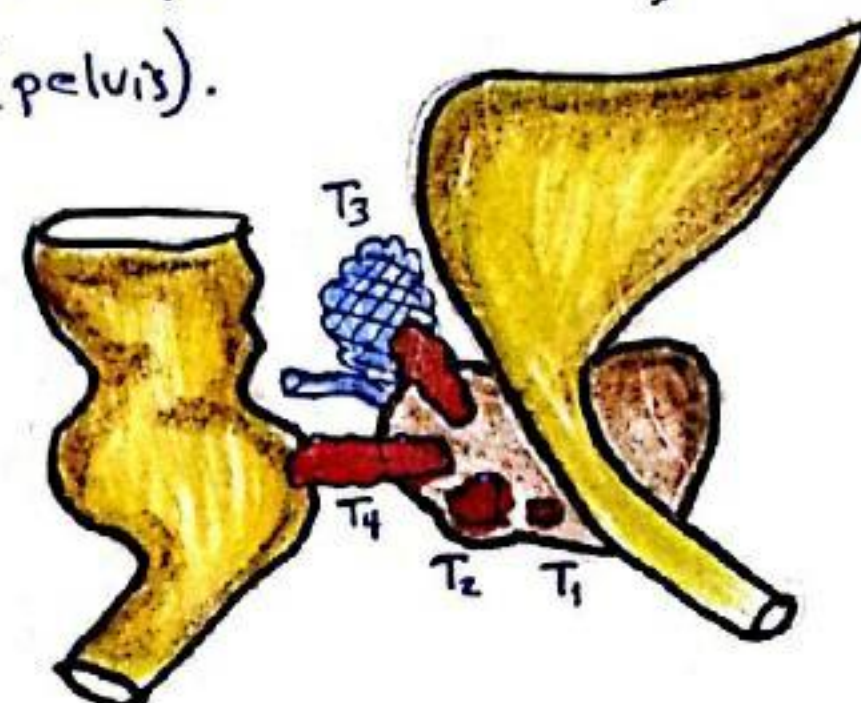
**M<sub>0</sub>** - no metastasis.

**M<sub>1</sub>** - there is metastasis

N<sub>1</sub> <2cm

N<sub>2</sub> = 2-5

N<sub>3</sub> >5cm



• Spread: 1- Direct :- seminal vesicle, bladder, ...etc

2- Lymphatic :- hypogastric → iliac LN → paraaortic LN.

3- Blood :- 90% to bone (lumbar vertebra → osteoblastic<sup>bone forming</sup>)

## \* Clinical Picture :-

→ Usually asymptomatic, detected by TURP, DRE, ↑ PSA "screening"

→ locally advanced disease → symptoms of urinary outflow obstruction (difficult micturition, retention, incontinence, hematuria, hemosperrmin)

→ metastatic disease → low back pain, lower limb oedema (iliac vein invasion)

renal failure, wt loss, tenesmus<sup>most common cause of death is refuse pt to surgery bec. he feel himself healthy no S/S</sup>  
paraplegia

## \* Investigations :-

- DRE, TRUS (transrectal US), laboratory (CBC, U/E/C, ....etc).

- TRUS guided biopsy (8-12).

- bone scan, CT scan to assess metastasis.

- Tumour marker ① PSA "prostate specific Ag"

② PAP "prostatic acid phosphatase."

③ Alkaline Phosphatase (ALP), ↑ in bone metastasis

④ PCA<sub>3</sub> (in urine), very expensive, not popular<sup>2005</sup>  
indicated if repeated -ve biopsies.

US → hyperechoic (whiter spot)  
hypo " (black)  
iso echoic = similar to prostate tissue

MRI



## \* Treatment :-

① Localized pr. cancer  $T_1, T_2$  :-

a- radical prostatectomy (remove prostate, seminal vesicle & out LN)

- It is major surgery with complications as :-

• incontinence :- usually cured within 6m - 1yr.

• impotence :- avoided if young by nerve sparing by wing microscopic transposition of sural nerve.

b- <sup>for unfit pt</sup> radiotherapy :- brach radiotherapy, radioactive seeds implantation.

- has complications as rectal ulcer

c- high intensity focus U/S :- (unfit pt) (HIFU)

d- watchfull waiting (no ttt) :- "conservative"  $\rightarrow$  if old, unfit pt.

② for pt with  $T_3, T_4$  :-

a- for  $T_3 \rightarrow$  hormonal ttt ( $\downarrow$  testosterone)

LHRH agonist (Zoladex), it initially  $\uparrow$  then  $\downarrow$  testosterone  
bilateral orchidectomy.

$\rightarrow$  Beclotamid (casodex) before LHRH by 2 wk.

b- for  $T_4 \rightarrow$  radiotherapy + hormonal.

③ for metastatic pt  $\rightarrow$  chemotherapy [docetaxil + prednisolone "Taxotene" & metoxantone]  $\rightarrow$  good result

give "Zoledronic acid" (Zometon) Preserve  $Ca^{++}$  inside bone if early bone metastasis to prevent path. \*.

## Causes of high PSA :- "N = 0-4 ng/ml" [4-10 = gray zone]

① prostate cancer ( $>10$  usually)

③ BPH

⑤ cystoscopy.

② - DRE or prostatic massage

④ Prostatitis

⑥ catheter

in pt 70-80 yr  $\rightarrow$  PSA 5-6 ng/ml is normal

## Types of PSA analysis :-

(PSA is an enzyme produced by prostate epith. cells to liquify ejaculate)

① PSA density ( $\uparrow$  according to prostate size). =  $\frac{\text{Prostate mass}}{\text{PSA}}$

② - PSA velocity. velocity of elevation

③ - PSA ratio =  $\frac{\text{free}}{\text{Total}}$  (if  $\leq 20\%$  may  $<10\%$  cancer malignant, if  $>20\%$   $\rightarrow$  benign)

- some pt  $\hat{=}$   $\uparrow$  PSA (4-10) give antibiotic course then repeat

PSA to exclude prostatitis

- if normal PSA & pt  $\hat{=}$  nodule on U/S  $\rightarrow$  do biopsy



## III PROSTATITIS

### A- Acute Prostatitis :-

- **Aetiology** :- usually from urethra, rarely blood born.
  - caused by E-coli, staph, strept, gonorrhoea.
- **C/Picture** :- pt feels ill, shiver, rigors, pain & heaviness in perineum and pain on defecation
  - Dysuria, pyuria, hematuria, frequency, urine retention (by abscess)
  - O/E  $\rightarrow$  enlarged, tender by P/R,  $\uparrow$  T<sub>v</sub>,  $\uparrow$  P.R.
- **Investigations** :- urine analysis, C/s, CBC, ESR.
- **Management** :- bed rest,  $\uparrow$  fluid intake, avoid alcohol & sexual intercourse
  - Antibiotic, if abscess incision & drainage.

### B- Chronic Prostatitis :-

- **Aetiology** :- as sequel of acute prostatitis.
- **C/Picture** :- Pain radiated to back, others as acute one.
- **Investigations** :- as acute, urethroscope, prostatic massage to obtain fluid C/s
- **Management** :- antibiotic, bed rest, fluid intake.

### \* **NOTES** :- during DRE (P/R) :-

- ① **BPH**  $\rightarrow$  - smooth, firm, symmetrical enlargement, sulci clear.
  - rectal mucosa slides, (long duration on history).
- ② **cancer**  $\rightarrow$  irregular, hard, asymmetrical, sulci obliterated.
  - rectal mucosa fixed. (short duration).
- ③ **prostatitis**  $\rightarrow$  smooth, soft, very tender (not done) (C/I).

\* **castration** (removal of testis) done for - religious or social reason  $\rightarrow$  south & east asia  
 - prostate cancer  
 -  $\downarrow$  sex drives, obsessions or behaviour  
 - male to female transsexuals, birth control

\* **Penectomy** (penis removal) done for ① cancer penis  
 ② Fournier's gangrene  
 ③ male to female transsexuals.

\* **nephrectomy** done  $\rightarrow$  for tumour, trauma, TB, non functioning kidney.



# PENIS DISORDERS

## I- HYPOSPADIAS

Toronto notes 2012

- \* **Definition**:- opening of the ext. urethral meatus on ventral side of penis.
  - according to severity may  $\rightarrow$  <sup>infertility</sup> difficult directing urine stream & infertility <sup>+ve F/H in 8%</sup>
- \* **Incidence**:- very common  $\frac{1}{300}$  live male births, White  $\gg$  black.
  - may associated  $\bar{e}$  undescended testis, ing. hernia, ventral penis curvature.

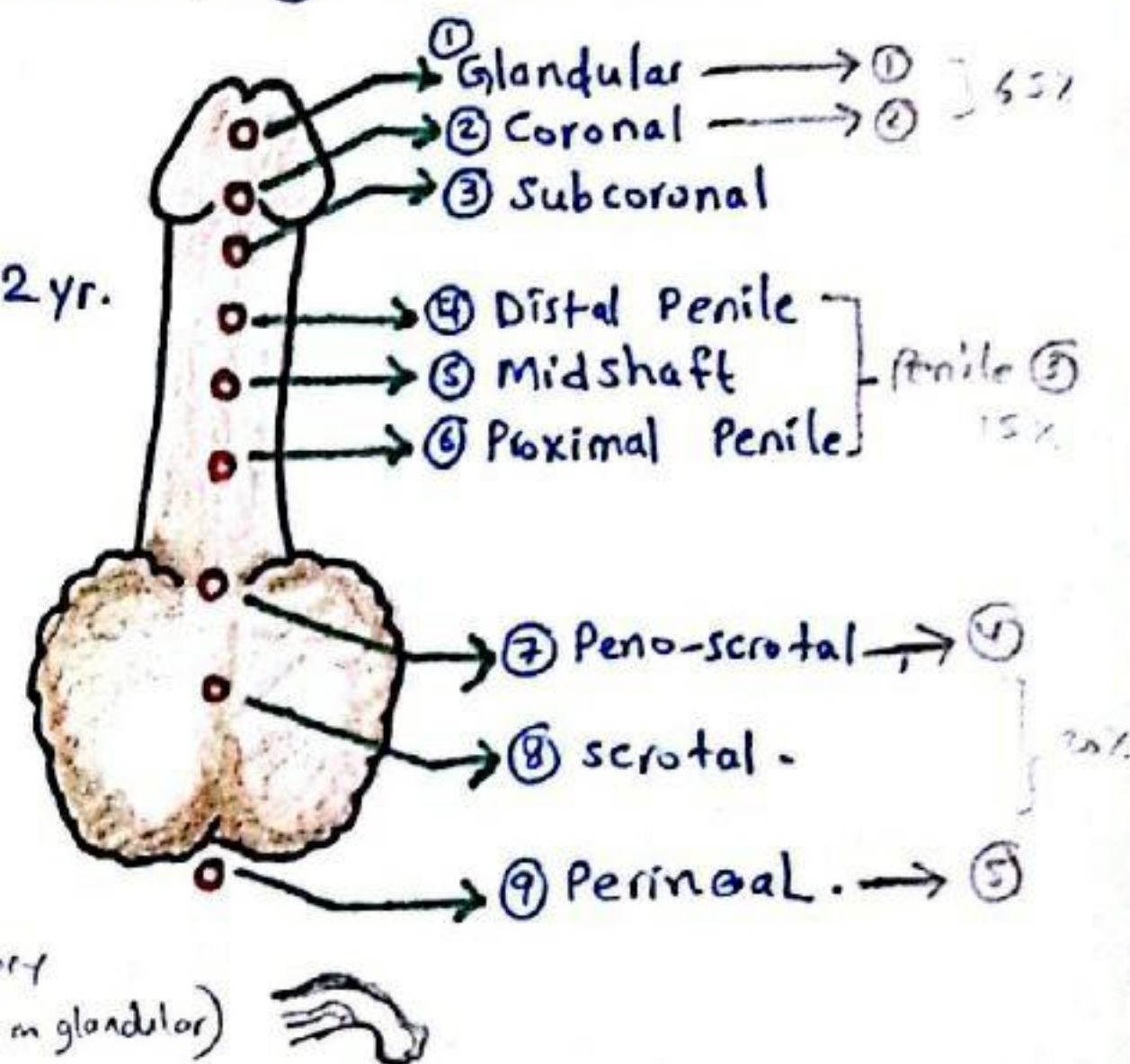
\* **Classifications**:- see diagram

- 9 degrees. (or 5 degrees)

\* **Treatment**:- early surgical correction before 2yr.

- **NB**:- circumcision should be deferred (postponed) because foreskin may be utilized in the correction.

- do u/s to exclude other anomaly
- the missing distal part of urethra is replaced by fibrous band (chordae)
- chordae must be released during surgery
- chordae  $\rightarrow$  ventrally curved penis (except in glandular)



## II- EPISPADIAS :-

\* **Definition**:- reverse of hypospadias (urethra opens on dorsum of penis).

\* **Incidence**:- rare  $\frac{1}{120,000}$  males &  $\frac{1}{450,000}$  female.

• In male:- 1- glandular  $\rightarrow$  not ass.  $\bar{e}$  incontinence.

2- penile  $\rightarrow$  75% all " "

3- peno-pubic  $\rightarrow$  95% " " "

4- complete type.

• Epispadias is a mild form of bladder exstrophy (congenital absence of portion of lower abd-wall & ant. bladder wall) = ectopic vesica.

• In female:- females  $\bar{e}$  epispadias have a bifid clitoris, separation of labia, & most of them are incontinent.

\* **Treatment**:- surgery to straighten penis & correct urethra & incontinence



### III PHIMOSIS & PARAPHIMOSIS

Toronto 2012

#### \* PHIMOSIS :-

- normal cong. adhesion separate by 1-2 yr of age
- Foreskin (Prepuce) <sup>inability to retract prepuce</sup> cannot be retracted over glans penis.
  - may be caused by ① balanitis (infection of glans) due to poor hygiene or ② cong.
  - complications are ① ballooning during micturition
  - ttt = circumcision. ② balanoposthitis (inflam. of prepuce), Paraphimosis & <sup>penile</sup> cancer

#### \* PARAPHIMOSIS :-

- Inability to reduce foreskin (<sup>caught behind</sup> ~~over~~ ↑ glans penis) → glans oedema.
- treated by circumcision.
- complications are: infection, glans ischaemia, gangrene.

### IV CIRCUMCISION

Toronto

\* **Definition**:- removal of foreskin (prepuce).

\* **Incidence**:- 30% worldwide, varies according to religion. <sup>muslims</sup> <sup>Jewish</sup>

\* **Indications**:- 1- religions

- 2- Phimosis, paraphimosis (recurrent), prior to radiotherapy of cancer penis
- 3- recurrent balanoposthitis, balanitis, UTI.

\* **Contraindications**:- ①- hypospadias.

② F/H of bleeding disorders (investigate prior to circum.)

③- unstable or sick infant.

\* **Complications**:- bleeding, infections, glans injury, urethral injury and meatal stenosis.

meatal stenosis:- caused by cong. web of epith. cells (ass. w hypospadias) and in adult by balanitis.

### V PRIAPISM

Toronto

erectile dysfunction < Priapism - impotence.

- prolonged unwanted erection lasting > 4 hrs.
- swelling of corpora cavernosa (no corpus spongiosum involved → flaccid glans)
- treated by urgent decompression via needle aspiration of blood if primary (unknown aetiology ≈ 50% of pt) or ttt underlying cause if secondary to sickle cell, trauma, medications (α blockers, anticoag... etc)



Impotence: inability to develop or maintain an erection of penis during sexual performance.

NB:- Peyronie's disease:-

- benign curvature of penis commonly dorsal  $\rightarrow$  upward curvature of erect penis.
- Usually 2<sup>nd</sup> to fibrous thickening of tunica albuginea.

## VI | PENILE TUMOURS :- (Rare)

• BENIGN :: cyst, hemangioma, nevus, papilloma.

• MALIGNANT :- (proliferation is a prevention) in male

- incidence:- rare (<1% of cancer in USA, 10% of africa), 6<sup>th</sup> decade
- aetiology:- chronic inflamm., STD, phimosis, uncircumcised penis
- Pathology:- sq. cc (>95%), basal cell, Paget's dis. of penis (rare)
- Diagnosis:- definitive Dx requires full thickness biopsy of lesion.
- Treatment:- wide surgical excision ± lymphadenectomy.
  - less aggressive Ht is CIS (cryotherapy, laser, etc).
- TNM classif.: T<sub>1</sub> → invade Buck's fascia → T<sub>1a</sub> no lymph or vessel involv.  
→ T<sub>1b</sub> with " " " "
- T<sub>2</sub> → invade corpus spongiosum or cavernosum.
- T<sub>3</sub> → " urethra or prostate.
- T<sub>4</sub> → " other adjacent structure.



# MALE INFERTILITY

Toronto 2012

## \* Definition:-

- failure to conceive after one year of unprotected, properly timed intercourse. [either primary "never conceived" or 2<sup>nd</sup> "conceive before"]

## \* Incidence:-

- 15% of all couples (1/3 male, 1/3 female, 1/3 combined problem).

## \* Aetiology:-

{commonest cause is varicocele}

- Idiopathic: 25% of infertile males.
- pretesticular (endocrinal):- e.g. Kallman's syndrome (cong. hypoth. hypogonadism)  
excess androgens, excess estrogen.
- testicular:- Varicocele (30-40% of infertile male) <sup>70% (lecture)</sup>
  - tumour, Post infection (mumps, STDs), torsion
  - cryptorchidism (<5%)
  - congenital → Klinefelter triad 
 $\leftarrow$  small, firm testis.  
 $\leftarrow$  gynaecomastia.  
 $\leftarrow$  azoospermia.
- Post-testicular (obstructive): vas obstruction
  - cong. Kartagener's syndrome (AR) (→ defective cilia.)
- others → retrograde ejaculation, drugs, CRF, ch. liver disease  
 medications (chemoth., <sup>anabolic</sup> steroid) → marijuana, cocaine, alcohol

## \* Physiology:-

- Testosterone is secreted <sup>90%</sup> from Leydig cells of testis under influence of LH from ant. pituitary
- about 10% secreted from Zona reticularis of suprarenal gland.  
(in female 100% of her testosterone from suprarenal gland).
- Testis considered endocrinal (secrete test. hormone) and exocrine at same time (secrete sperm "not semen").
- spermatogenesis takes about 72 days.



\* Diagnosis :-

- good history & examination.

• Investigations:-

- 1- semen analysis (SA) [at least 2 properly specimens over several weeks]
- 2- hormonal analysis [rare to be abnormal if normal SA]  $\rightarrow$  test., FSH, LH.
- 3- genetic evaluation, immunological study (antisperm Ab in ejaculate or bd).
- 4- testicular biopsy in azospermia.
- 5- scrotal <sup>& doppler</sup> US (varicocele, testicular size).
- 6- Vasography.

WHO Guidelines Normal semen:-

- Volume 2-5 ml/ejaculation
- Number >20 million/ml (20-100)
- morphology: <40% abnormal
- motility: >50% motile
- liquifaction: in 20 min
- PH: 7.2-7.8
- WBC <10/HPF

Toronto 2012

\* Treatment :-

- life style  $\rightarrow$  exercise, healthy diet, sexual education.
- eliminate alcohol, smoking, drugs.
- treat underlying cause.



# HAEMATURIA

**\* Definition :-** presence of RBCs in urine

**\* Types :-** • According to No. of RBC :-

1- Microscopic H. → 1-5 RBC/HPF in male (8-10 in ♀).

2- Macroscopic H. → by naked eye.

• According to timing of H. :-

1- initial H. → due to urethral & prostatic lesions.

2- total H. → upper tract (kidney, ureter <sup>lesion</sup> & bladder ca)

3- terminal H. → lesion in neck or trigone of bladder.

• According to pain if present :-

1- Painful H. → e.g infection, stone, ~~ph~~...etc

2- Painless H. (silent) → malignancy (ca bladder)

## D/D of coloured urine :-

1- concentrated urine → dark urine

2- obstructive jaundice → dark, Tea-like, frothy urine

3- Drugs → • pyridium, furantoin & Dindevan → deep red orange  
• Rifampicin → deep yellow

4- hemoglobin urea, myoglobinurea, acute porphyria

**NB :-** bleeding through urethra ≠ no urine called bleeding per urethra

## \* causes :-

- (A) medical causes :- glomerulonephritis, HPN, vasculitis, interstitial diseases of kidney, renal artery thrombosis or embolism  
- drugs → anticoagulant, cyclophosphamide.  
- coagulopathy as hemophilia & thrombocytopenia.  
- polycystic kidney & sickle cell disease.

- (B) Surgical causes :- infection, tumour, trauma, stone, BPH.  
- diverticulitis (bladder), bilharziasis, cervical tumour.

**NB :-** presence of clot in urine indicate :-

1- severity of pathology.

2- site of bleeding e.g if threadlike from upper U.T.

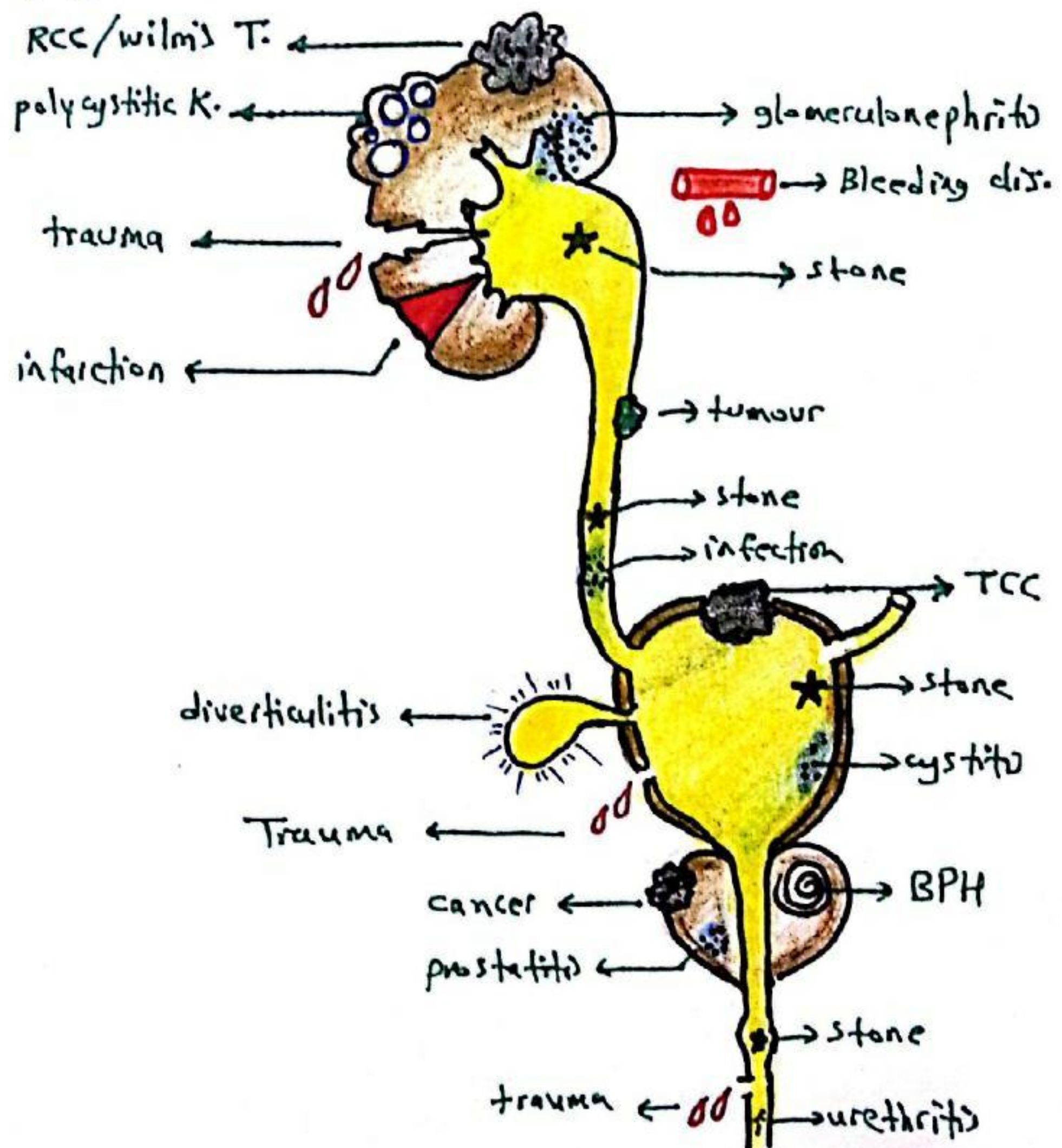


### \* Diagnosis :-

- good history  $\rightarrow$  pain, dysuria, stream of urine, F/H, past medical ...etc
- good examination  $\rightarrow$  e.g suprapubic tenderness ---etc
- investigations:  $\rightarrow$ 
  - 1- Urine analysis ( $>10$  RBC /HPF significant), WBC, C/S.
  - 2- CBC, U/E/C.
  - 3- U/S, IVU, CTU, MRU. KUB
  - 4- cystoscopy, biopsy.
  - 5- retrograde pyelography, ascending cystography.
  - 6- CT scan

### \* Treatment:-

- if sever bladder hge  $\rightarrow$  ABC if needed.  
 .irrigation via catheter  $\bar{=}$  normal saline (remove clots)  
 .cystoscopy in quite active bleeding.
- Treat the underlying cause



causes of hematuria



# OBSTRUCTIVE UROPATHY

- Obstructive uropathy include any obstruction that occurs anywhere in urinary tract. with the following symptoms:-

1. obstructive symptoms:- hesitancy, weak interrupted slow stream & post-micturition dribbling of urine.
2. Irritative symptoms:- frequency, dysuria, urgency & urgent incontinence.

NB:- Prostatism include obst. + irritative symptoms.

## \* Classification:-

- Acute or chronic obstruction.
- Congenital or acquired.
- unilateral or bilateral.
- partial or complete.
- extrinsic or intrinsic.

## \* Aetiology:- (acc. to level of obst.):

- Renal :- 1- congenital → pelviureteric junction obstruction (PUJ. obst)  
aberrant renal artery. horseshoe kidney
- 2- Tumour → Wilms' tumour, renal cell carcinoma, pelvic tumour
- 3- Stones in renal pelvis, TB stricture
- Ureteric:- 1- lumen → stones, blood clot.
- 2- Wall → cong. stricture (atresia), urethrocele, acquired stricture (TB, traumatic,  $\Phi$ , ...-etc), tumour.
- 3- outside wall → pelvic malignancy, idiopathic retroperitoneal fibrosis.
- Bladder:- Tumour (TCC) invading ureter, neurogenic bladder dysfunction  
bladder neck <sup>stenosis</sup> stricture (cong., bilharzia, tumour). diverticulae.
- Prostate:- BPH, cancer, prostatitis. → Bladder neck contracture = (Marion's dis.)
- Urethral :- posterior urethral valve, cong. mental stenosis.
- urethral stricture (inflam., traumatic, malignant). stone
- phimosis & paraphimosis.

- In CRF → ↑ urea, ↑ creatinine, ↑  $PO_4$ , ↓  $Ca^{++}$ , ↓ Hb  
- (IVU) to see if secreting kidney, (isotope scan) to see if functioning



**NB**:- Urinary obstruction (stasis) can be classified into:-

- according to aetiology  $\rightarrow$  congenital & acquired.
- " " duration  $\rightarrow$  acute & chronic.
- " " level of obst.  $\rightarrow$  upper, middle & lower.
- " " degree " "  $\rightarrow$  partial & complete obstruction.

$\rightarrow$  if pt have colicky pain  $\rightarrow$  partial obst or small stone

### \* Congenital causes:-

- Pelvi-ureteric junction (PUJ) obstruction
- aberrant renal artery.
- ectopic ureter.
- vesico-ureteric reflux (VUR).
- ureterocele & cystocele.
- neurogenic bladder injury (S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub>) as in spina bifida.
- posterior urethral valve.
- Distal urethral stricture
- cong. external urethral meatal stenosis

- old male  $\rightarrow$  prostate  
urethral stricture

- child  $\rightarrow$  Post urethral V.  
PUJ  
VUR.

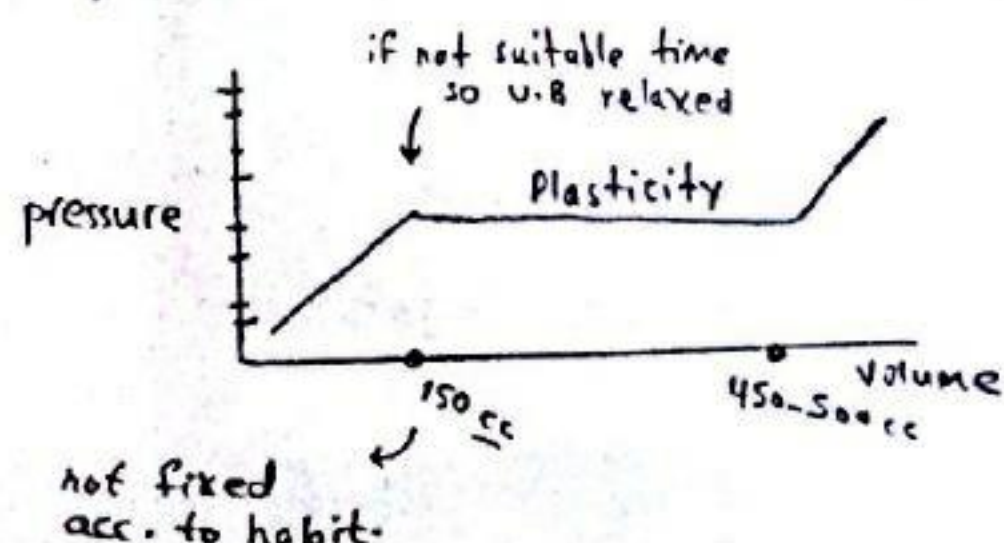
### \* Acquired causes:-

#### ① Primary (within urinary tract):-

- Kidney stones (renal pelvis), tumour, cyst, hydronephrosis
- Ureteric stone, stricture, tumour.
- Bladder tumour
- prostate enlargement.
- Ext. urethral meatus stricture (after circumcision)
- Urethral stricture  $\rightarrow$  (injury, catheter, infection as gonorrhoea)

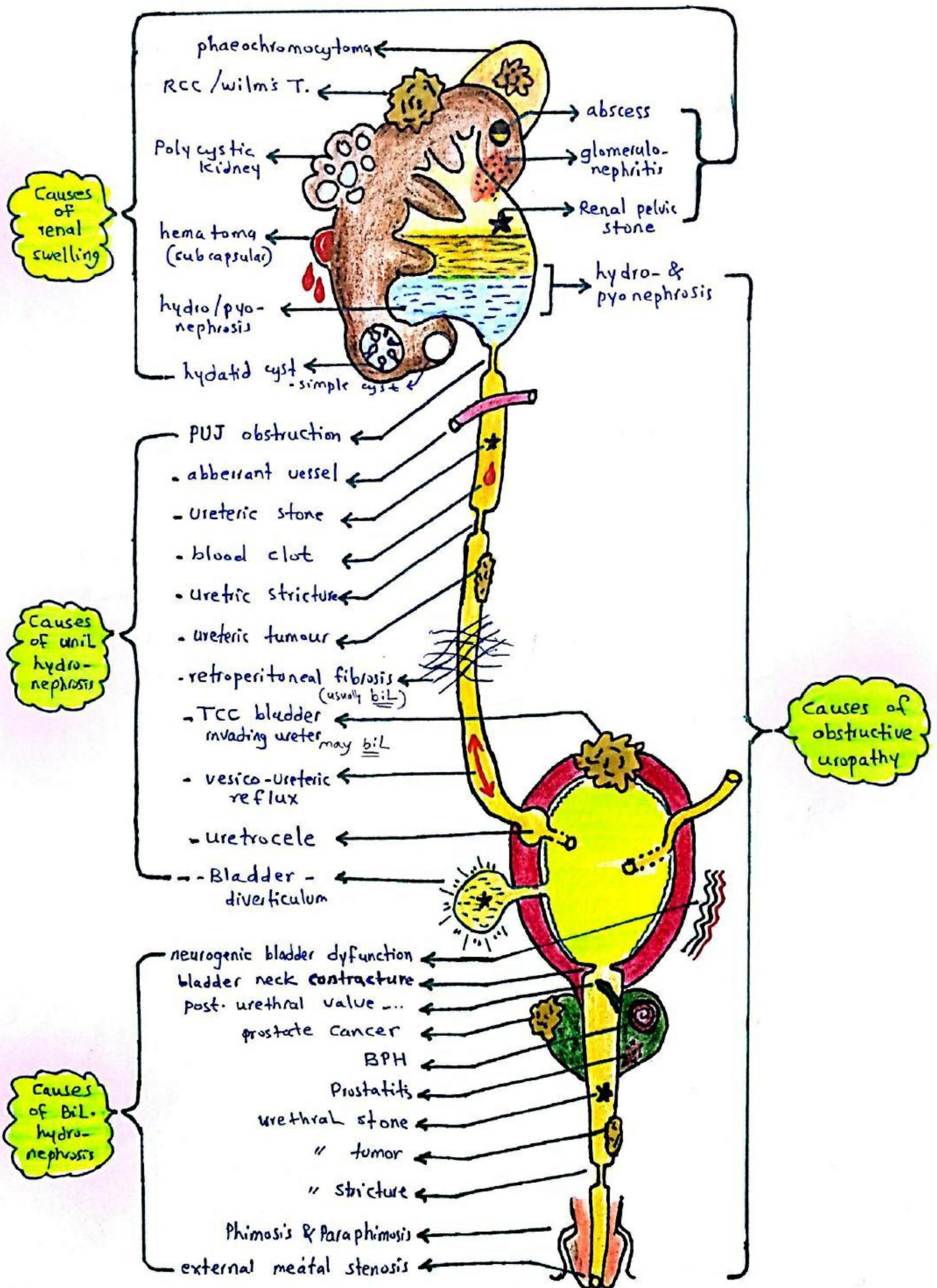
#### ② Secondary $\rightarrow$

- pregnancy (mechanical obst by foetal head, hormonal  $\downarrow$  <sup>ureteric</sup> peristalsis)
- retroperitoneal fibrosis.
- pelvic tumours or metastatic LN.



normal pressure for U.B = 30 cm/H<sub>2</sub>O.







## \* Notes :

### • D/D of filling defect in bladder on IVU:

- Tumour, stone, blood clot, pallor of catheter.

- cystocele, middle lobe of prostate.

- Diverticulum either - cong. (all layers → true)

or - acquired (mucosa → false)

} to differentiate ask pt to pass urine if still full → acquired as cong. has muscle to void.

### • Indications of nephrectomy:-

- Tumour, TB, pyelonephrosis, donation.

### • Complication of obst. uropathy:-

1- infection due to stasis. & stone formation

2- hydronephrosis & hydronephrosis.

3- acute & chronic retention.

4- Ch. renal failure (CRF) if bilateral.



# HYDRONEPHROSIS

## \* Definition :-

- It is a septic distension of renal pelvis & calyces due to partial or complete obstruction.

## \* Aetiology :-

• see causes of obstructive uropathy. (Page 33, 35)

① Unilateral hydronephrosis: → ureteric stone, tumour, stricture, clot, ... etc

② Bilateral hydronephrosis: → retroperitoneal fibrosis, prostatic & urethral causes.

• according to age:

① in children → <sup>post u. valve</sup> PUJ obst, VUR (vesico-ureteric reflux), cong. stricture, neurogenic bladder (bladder dysenergia) --- etc

② in adult → prostate enlargement, stone, urethral stricture, tumours in trigon. → bil hyd. , --- etc.

## \* C/Picture :-

- 1- <sup>(commonst)</sup> Pain :- slight, dull aching or discomfort.
- 2- asymptomatic → discovered accidentally by US.
- 3- Swelling :- specially in children.
- 4- S/S of underlying cause, or S/S of complications. (CRF, ... etc)

## \* Complications :-

- 1- infection → pyonephrosis, stone formation.
- 2- complete cortical atrophy.
- 3- CRF (if bilateral).
- 4- rupture "rare" → usually traumatic.

## \* Investigations :-

- 1- Urine analysis (RBC, WBC, SG & crystals) <sup>PH 5-7</sup>  
 $\begin{matrix} 10^3 + \text{symptomatic pt} \rightarrow \text{significant} \\ \rightarrow 10^5 \text{ significant} \\ \rightarrow N=1005 \end{matrix}$
- 2- US, CT, IVU (to assess if secreting kidney), isotope scan (to assess <sup>kidney</sup> functioning)
- 3- Ascending (retrograde) pyelogram. or descending (antegrade) pyelogram.

## \* Treatment :-

- treat underlying cause.
- nephrectomy if there's  $\begin{cases} \rightarrow \text{non-functioning kidney by infusion urography.} \\ \rightarrow \text{US showed very thin parenchyma.} \\ \rightarrow \text{renal scan shows zero function.} \\ \rightarrow \text{other kidney normal.} \end{cases}$
- nephrostomy till treating obstruction. → then pyeloplasty if kidney functioning  
 $\hookrightarrow$  in advanced cases to ↓ size of pelvis.



# POLYCYSTIC KIDNEY

cong. multicystic k.

## \* Aetiology:.

- failure of fusion of collecting system (developed from mesonephric ureteric bud) with secretory system (metanephric cap).

## \* types:-

### ① Infantile type (AR):- "rare"

- very large kidney may obstruct labour.
- may die of pulmonary hypoplasia.
- renal failure, rickets are known complications.

### ② Adult type (AD):-

- incidence:- common than infantile type. (almost always bilateral)
  - about 50% <sup>of pt</sup> have cyst in liver (normally functioning liver), pancreas and 30-40% of pt have intracranial aneurysm.
- c/picture:- before 10 yrs no s/s (cysts do not form before age of 10y)
  - from 10-30 yrs → no s/s but US shows cysts.
  - after 30 yr → hematuria<sup>25%</sup>, hypertension<sup>70%</sup>, UTI, flank pain, uremia (renal failure by age of 50). → due to renin-ANG system
  - Pain due to Hge inside cyst, renal colic due to clot or stone
  - s/s of complications.
- Investigations:- Urine analysis (RBC, WBC, --etc), US → (diagnostic)
  - KUB, IVU (enlarged kidney & spider shaped calyces)
  - CT, ; blood u/e/c.
- treatment:- control hypertension, treat UTI.
  - low protein diet, drink excess fluid<sup>3L/day</sup>.
  - if large cyst compresses pelvis → percut. u/s guided aspiration
  - Surgical (Rovsing's operation) to puncture superf. large cysts (to avoid compress. Hge, pain-) → not done bec. <sup>u/s</sup> aspiration better
  - If renal failure occurs → hemodialysis or renal transplantation.



**NB:- Simple renal (solitary) cyst:-**

- Cyst not clear whether cong. or acquired.
- commonly asymptomatic or dull flank pain.
- may complicated by Hge <sup>or infection</sup> inside cyst → acute symptoms.
- must be differentiated from neoplastic renal mass (by US, CT).
- No treatment, if causes hydronephrosis → aspiration US guided.  
or surgical excision (rarely needed).

**PUJ OBSTRUCTION :-**

- Pelvic-ureteric Junction obstruction (PUJO) is a common cause of hydronephrosis in children & adolescents.
- seen more in males with Lt side predominating. (10-15%) bilateral
- caused by failure of relaxation of PUJ.
- diagnosed by U/S in utero (if severe) but may be asymptomatic and detected incidentally during exam. (abd. mass, pain in flank, UTI)
- Dx by IVU → dilated pelvicalyceal system & abrupt contrast arrest at PUJ. with absent or normal caliber ureter.
- treated by pyeloplasty or endoscopic endopyelotomy if failed surgery and if kidney not functioning → nephrectomy.

**URETROCELE :-**

- cystic dilatation of terminal part of ureter (intramural part).
- presented & recurrent UTI, colic (due to stone inside it).
- IVU shows "Cobra head" sign or by cystoscopy → cyst.
- treated by excision & reimplantation of ureter specially if complicated by
  - stone formation.
  - hydronephrosis.
  - recurrent UTI.



## Posterior urethral valve :-

- the most common cause of obstructive uropathy in infant & newborn.
- occurs only in male.
- **Pathology**:- cong. membrane-like structure in distal prostatic urethra.
- **C/picture**:- in severe forms → palpable kidney (hydronephrosis), renal failure  
- in less severe forms → recurrent UTI, voiding dysfunction.
- **investigations**:- Voiding (micturating) cysto-urethrography (MCU) → [dilated posterior urethra & bladder ± reflux]
- **treatment**:- transurethral destruction of the valve.

## Vesico-ureteric reflux :-

- **Incidence**:- 5 times more in female.
- **aetiology**:- due to defective valve at entry of ure
- **C/Picture**:- recurrent UTI, hydronephrosis. commonest cause of UTI in children (1/3 case)
- **investigations**:- MCU "micturating cystourethrography"  
- cystoscopy: → ureteric openings are laterally placed, wide base of trigone, short submucosal ureter.

## Bladder diverticula :-

- **Definition**:- flask-shaped pouch of bladder wall (95% of pt are male).
- **Aetiology**:- ① congenital: (rare) → true (all layers of bladder wall), solitary, above ureteric orifice. (empties urine & emptying bladder no residual urine)  
② Acquired: (common) → false (no muscle layer) often multiple, always ass. & distal obst. & trabeculation (↑ pressure)  
- not emptying & bladder (residual urine inside).
- **C/picture**:- usually a symptomatic: s/s of underlying disease.  
- double micturation (filled & urine at micturation then empty to bladder → immediate desire to micturate again).
- **Complications**:- rarely may obstruct ureter if large, hydronephrosis.  
- stone, infection, sq. metaplasia → sq. C.C.



- investigation :- IVU , ascending cystography , cystoscope.
- treatment :- treat underlying cause.
  - Diverticula are not excised unless complicated.

### Retroperitoneal fibrosis :-

- ① Primary (Idiopathic) retroperitoneal fibrosis is of unknown aetiology but
  - may be drug induced e.g. methysergide (used in prophylaxis of migraine)
  - pt may present acutely with anuria. (anuria  $\rightarrow$  no urine for 24 hr)
  - there is  $\uparrow$  ESR,  $\uparrow$  urea,  $\uparrow$  creatinine (usually  $\uparrow$ ed).
  - IVU shows medially pulled both ureters.
  - CT shows retroperitoneal fibrous plaque (in w there's ureter, aorta, --etc)
  - treatment :- release ureter from fibrous tissue (ureterolysis).
- ② Secondary retroperit. fibrosis :-
  - secondary to leaking aortic aneurysm.
  - secondary to diffuse infiltrating retroperitoneal malignancy.



⑤

## RENAL TUMOURS

### (A) BENIGN :- (rare)

- ① Adenoma :- most common benign, pea-like, <sup>usually</sup> asymptomatic  
- if diagnosed must removed (10% change malignant)
- ② Angioma :- may cause profuse haematuria.
- ③ fibroma.
- ④ Lipoma.

5- angio myo lipoma

6- oncocytoma

### (B) MALIGNANT :- (1° or 2°) → the 1° are :-

- ① Wilms tumour (nephroblastoma) in children.
- ② Renal cell ca (hypernephroma) in adult.

[NB] As benign tumours are rare so all neoplasms discovered in kidney considered malignant until prove <sup>otherwise</sup>

- ③ others :- sarcoma, transitional cc & sq. cc "in pelvis"

## WILM'S TUMOUR "nephroblastoma"

95% of urinary tract malignancy.  
\* Incidence :- represent < 10% of childhood malignancy.

site - about 10% are bilateral

age :- 90% < 7 yr "peak 3-4 yr" (2-3 ys)

### \* Pathology :-

● Macro :- usually unilateral, more in upper pole.  
- cut surface : <sup>no capsule</sup> greyish or pinkish & area of Hge, necrosis

● Micro :- Mixed tumour : containing epith. & C-T cells which arise from embryonic nephrogenic tissue (multipotent mesodermal cells), [CT may be ms, bone, cartilage]

● Spread :- ① direct, ② Haematogenous (Lung) ③ Lymphatic (less common).

● Staging :- Stage I :- limited to kidney "complete resection"  
- Stage II :- extend beyond kid. (but " " )  
- Stage III :- residual tumour confined to abdomen.  
- Stage IV :- Distant metastasis (blood).  
- Stage V :- Bilateral tumour.

Wilms tumour occur alone or as part of **WAGR** syndrome (**W**ilms, **A**niridia, **G**enitourinary malformation, mental **R**etardation)



### \* C/P of Wilms' tumour:-

= presented in 1<sup>st</sup> 4 yrs of life by.

①- flank mass (90%).

②- pyrexia (50% of pt).

③- Pain (rarely) vague abd. pain. (some say 40%).

④- hypertension (in 60% of pt): to to ↓ renal bd supply → Renin.

⑤- haematuria: (late sign).

⑥- wt loss, congenital aniridia (1-2%), metastasis s/s.

\* Investigation: Laboratory, U/S, CT scan, IVU.

### \* Treatment:-

= Nephrectomy in operable cases as soon as possible, followed by radiotherapy & or chemotherapy

= partial nephrectomy may be possible in bilateral

= Palliative Rx in inoperable cases.

### \* Prognosis:-

= 5 year survival rate is 80% in pt < 1 yr.

= Less good prognosis in older children.

NB • Wilms' tumour is associated & chromosome 11 abnormality

### NOTES

- 30% of Wilms tumour are hereditary

- Renal cell carcinoma associated with chromosome 3 and HLA type BW-44 and account for 85% of all renal tumour. / associated with the WT gene on chromosome 11

- may be associated with mental retardation



(7)

## RENAL CELL CA.

accounts 3% of adult malignancy

"Hypernephroma - Adenoca. or Grawitz's tumour" i.e Medulla

\* **Incidence**:- most common neoplasm of kidney (80%)  
 - arising from cell of proximal convoluted tubule but may cortex  
 - affecting male > female (3:1), old age 50 yr (40-70)

\* **Aetiology** (risk factors): male, smoking ~~cadmium~~, adenoma kidney.

\* **Pathology**:- age, obesity, diet, hepatopathy (Stuffers syndrome) Von Hippel Lindau disease  
 Adult polycystic kidney

• **Macroscopic**:- Commonst in upper pole, bilateral in (1-2%).  
 - cut surface yellowish (lipid), trabeculated & areas of Hge & necrosis, fibrosis. **4% synchronous**

• **Micro**:- Adenoca., there's cuboidal or columnar cells (sheets)  
 & tumour is very vascular. **4% multiple at same kidney**

• **Spread**:- ① Direct. ② blood (Lung → Cannon ball, LBB) ③ lymphatic parastatic

• **staging**:- stage I:- within renal capsule.

• stage II:- outside capsule but in Gerota's fascia.

• stage III:- regional LN, renal vein or IVC involvement

• stage IV:- adjacent organs or distant metastasis.

\* **Clinical picture**:-

Indicate sita > size of tumour

① Typical presentation: 1- haematuria (most common) 50% of pt  
**Israil triad**  
 2- Pain (in 40%) due to capsule stretch, nerve inv.  
 3- Renal mass (in 30%) irregular, hard

② Atypical present.:- <sup>in 25%</sup>  
 1- rapidly developing varicocele (2°).  
 2- fever (may be only symptom), wt loss, night sweat  
 3- systemic (Para malignant syndrome):  
 • hypercalcaemia (in 5%) due to Para-thormon like substance from tumor or bone metastas  
 • polycythemia:- ↑ renal erythropoietin  
 • Amyloidosis

③ Metastatic manifestations:- pathological X, hemoptysis -- etc  
 varicocele (Rt or Lt) leg oedema, dilated ven (IVC metas)

**Von Hippel Lindau disease** : AD, caused by mutation on Chromosome 3

it causes tumour of kidney, eye, CNS, gonads, adrenal and pancreas



## \* Staging:-

T<sub>0</sub> = renal mass -ve for tumour.

T<sub>1</sub> → a (<5cm), b (5-7cm)

T<sub>2</sub> → >7cm

T<sub>3</sub> → invading pelvic calyceal system or malignant thrombus renal vein

T<sub>4</sub> → distant metastasis.

## \* Treatment:-

- 1] Surgical • Renal sparing surgery:- surgical removal of tumour (intraoperative upper transverse incision) allows staging & control of I.V.C & provide access to renal vein during resection.
  - Radical nephrectomy:- remove kidney, suprarenal gland, perinephric fat & LN. taken enblock.
- 2] immunotherapy:- interferon α / interleukin 2 can be helpful.
  - If unfit → embolization of renal a (autonephrectomy)

## \* Prognosis:-

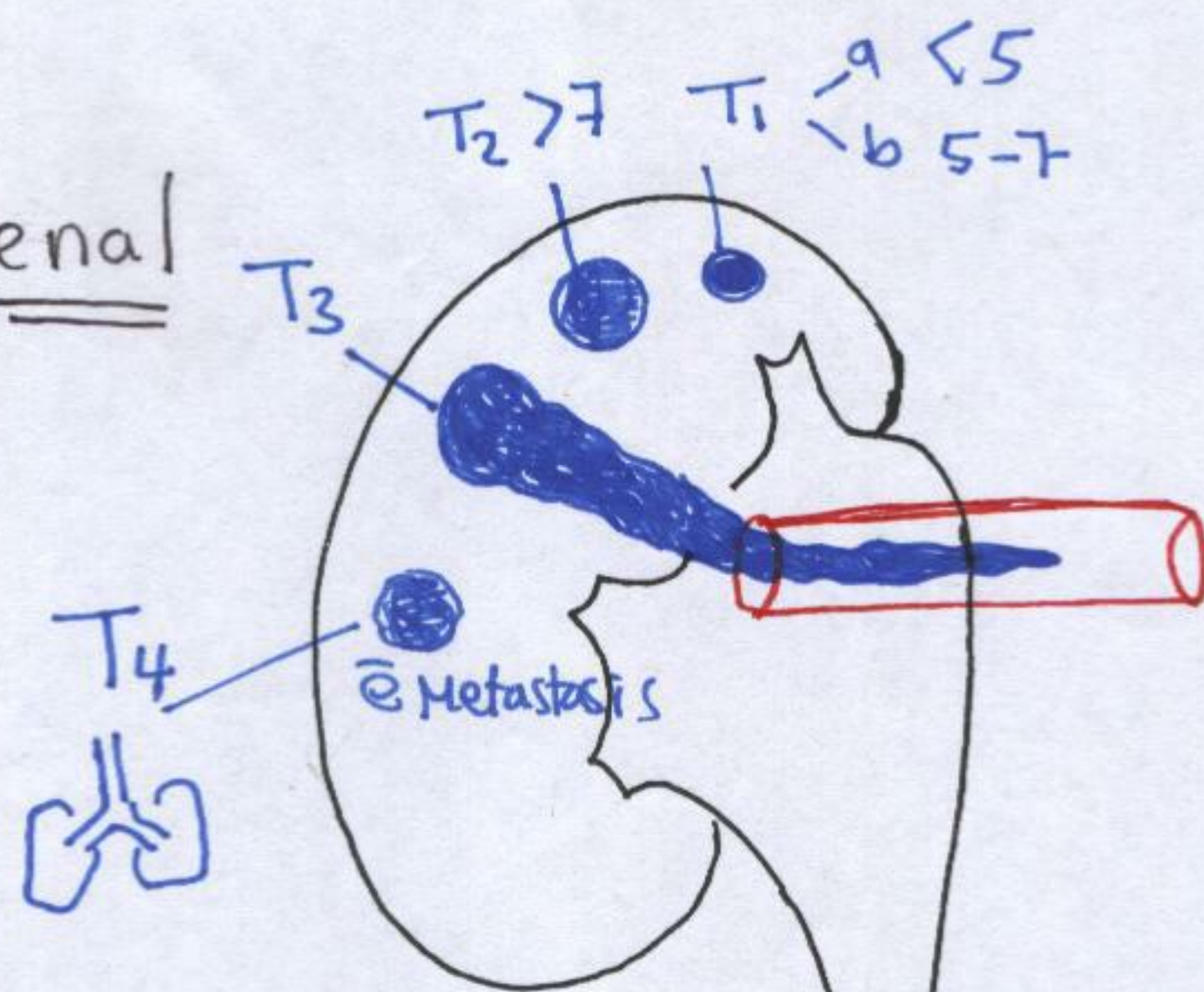
- removal of even largest neoplasm may cure the patient.  
65% is 5 year survival rate

## \* investigations:-

- laboratory → urine analysis, U/E/C, CBC. --etc
- Radiological:- IVU (filling defect, assess funx of other kidney)
  - U/S, CT scan. , metastatic work up
  - Renal angio (differentiate from cyst, aneurysm...)



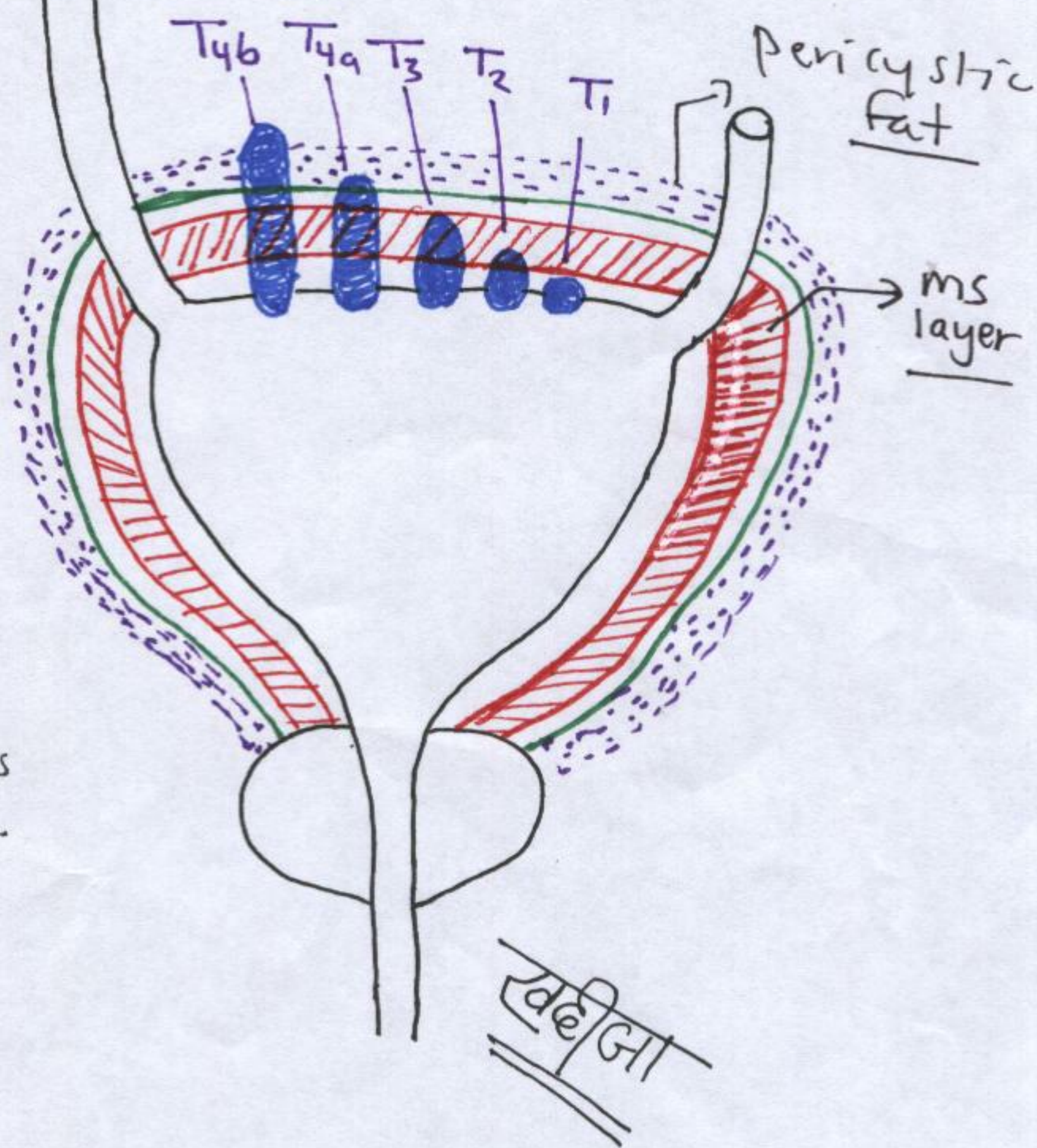
\* Renal



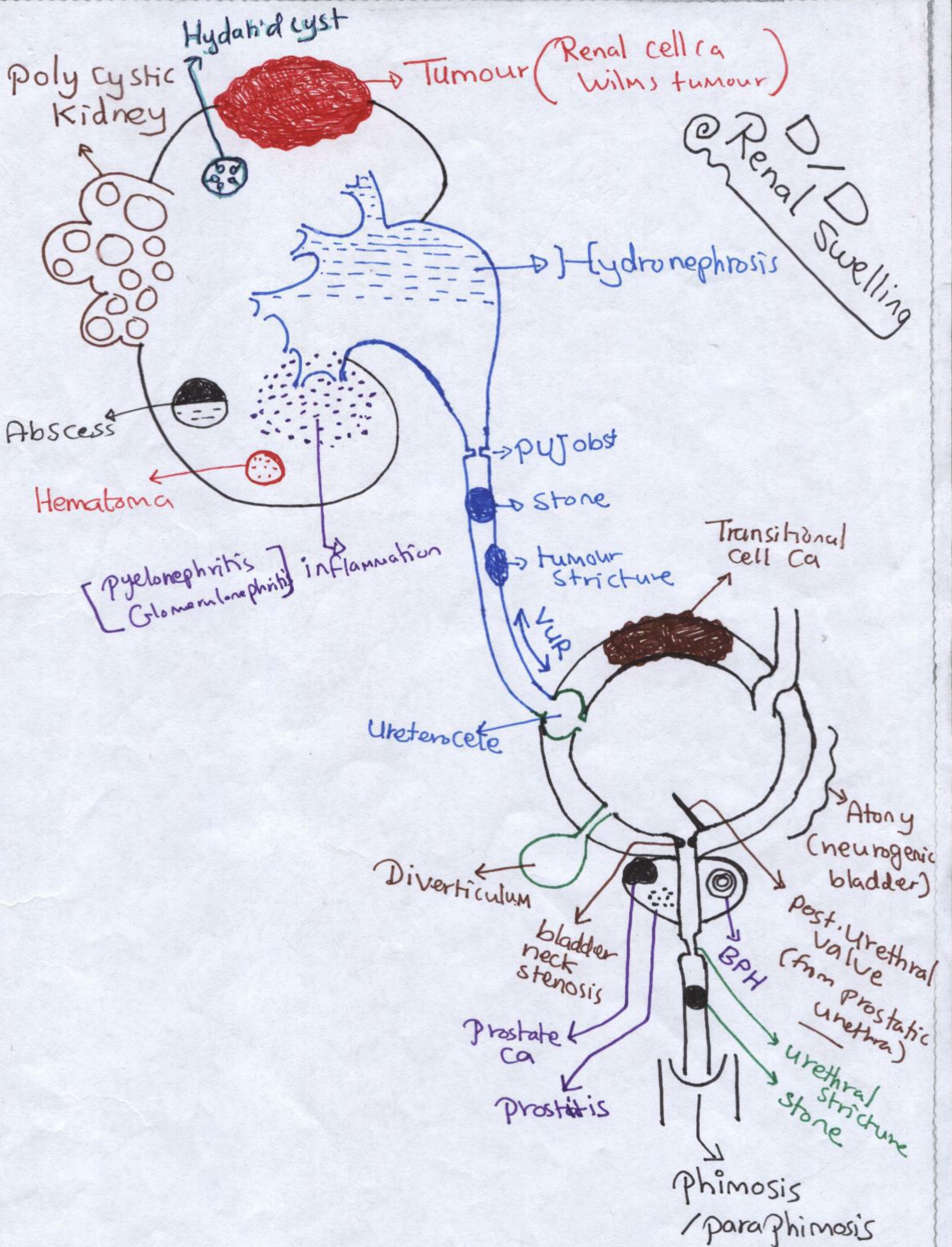
Staging  
Renal cell Ca  
& bladder Ca

\* Ca bladder

- N<sub>1</sub> → involve L.N below bifurcation of common iliac a.
- N<sub>2</sub> → involve L.N above bifurcation of common iliac a.
- M<sub>0</sub> → No Metastasis
- M<sub>1</sub> → Metastasis.









# URINAR BLADDER TUMOURS

## \* UROTHELIAL TUMOURS :

- They are the tumours arising in "collecting system" from renal pelvis to urethra.
- They are usually multicentric (arise more than one place).
- They usually have high recurrence rate.

## \* URINARY BLADDER TUMOURS

- They may be
  - Benign
    - (epith) :- <sup>villous</sup> papilloma, adenoma, <sup>"pre-can"</sup>
    - (c.t) :- angioma.
  - Malignant
    - (1<sup>st</sup>) :- carcinoma.
    - (2<sup>nd</sup>) :- from surrounding.

## \* CARCINOMA OF BLADDER :

**\* Incidence** :- the 2<sup>nd</sup> commonest malignancy after prostate ca., the 3<sup>rd</sup> is kidney.

- Common in male (3:1 = ♂:♀) age 45-55 yr, ↑ in white people

**\* Aetiology** :- not known, but predisposed by:-

- occupational (33%), exposure to carcinogens as naphthylamine, aromatic amines, benzidine... etc which is common in Dye worker, painters, Tyre workers, etc <sup>20%</sup>
- cigarette smoking <sup>4 times risk</sup>
- Genetic factors
- Irradiation
- villous papilloma & diverticula
- chronic cystitis
- bladder stone, bilharzia.

**\* Pathology** :-

**• Macroscopic** :- commonest site is bladder base "trigone", the second common is inferolateral wall (↑ in sq.c.c.) <sup>(↑ in TCC)</sup>

- It may be single or multiple.

- It may look papillary (fungating), lump or ulcerative type

- Micro** :-
- Transitional cell ca (TCC) → >90%
  - Squamous cell ca (sq.c.c) → 5% → 8%
  - ~~Adenocarcinoma & others~~ → 5% → 2%

(NB) sq.c.c. usually following ♂ or stone due to metaplasia of transitional cells by ch. irritation



(2)

## • spread of bladder ca. :

- 1- Direct "Local" to bladder wall & adjacent organs.
- 2- Lymphatic:- int. & ext iliac LN → para aortic LN.
- 3- hematogenous: (very late) to Lung, Liver, bone, brain.
- 4- Implantation: in papillary ca. type & in scar of operation

## • Staging & grading :-

- Grade :- I: well differentiated (small sized papilla, very narrow base)  
II: less diff. (wide base papilla).  
III & IV: Un diff. (anaplastic).

• Staging: by TNM staging system.

- **T<sub>is</sub>** :- Tumour in situ (usually high grade II or III) Submucosa
- Ta = in mucosa**
  - T<sub>1</sub> :- " involving basal membrane " lamina propria "
  - T<sub>2</sub> :- " " " " & 1<sup>st</sup> half of ms layer
  - T<sub>3</sub> :- " " " whole ms layer.
  - T<sub>4a</sub> :- " spread to pericystic fat.
  - T<sub>4b</sub> :- " " " adjacent organs as vagina, prostate
- N<sub>1</sub> :- involve LN below bifurcation of common iliac a
- N<sub>2</sub> :- " " above " " " " "
- M<sub>1</sub> :- metastasis (to LLBB).

• Also tumours "As TCC" can be divided into 3 groups.

- 1- Carcinoma in situ "histological change of malignancy"
- 2- Superficial "non ms. invasive" bladder ca.
- 3- Muscle invasive cancer.

## \* Clinical picture :- incidental 10% (asymptomatic)

70-90%

- In early cases: Painless intermittent hematuria (in >80%) ± clots.
  - urgency, frequency, dysuria & weak stream.
  - no signs clear, diagnosed only by cystoscopy.
- In late cases:- wt loss, anemia, uremia symptoms.
  - frequency, painless micturation, retention by passage of tumour pieces in urine, loin pain, suprapubic pain
  - Signs are feeling of hard mass in bladder base during bimanual exam under GA (hand in rectum ♂ or vagina ♀) and other over abdomen.
  - it helps also in staging as if bladder fixed or not during exam.

**NB : Bladder ca can mimic UTI & hematuria**



## \* Treatment :-

T<sub>is</sub> & T<sub>1</sub> → ① TURP

② - cystoscopy & follow up.

③ - local installation of chemotherapy intravesical (↓ recurrence & progression) as BCG (Bacille Calmette Guerin).

T<sub>a</sub> → ① TURP

② cystoscopy program  $\left\{ \begin{array}{l} \text{check every 3 months} \rightarrow 2 \text{ yr} \\ \text{" " 6 " } \rightarrow 2 \text{ yr} \\ \text{" " 12 " } \rightarrow 2 \text{ yr} \end{array} \right.$

T<sub>2</sub> → ① TURP

② cystoscopic program

③ radical resection (Gold standard)

T<sub>3</sub> → ① surgical if no metastasis

[a] partial cystectomy ± safe margin + cystoscopy program.

[b] radical cystectomy then do urinary diversion. \*2

• Male: remove bladder, distal part of ureter, prostate, seminal vesicle & LN.

• female: remove bladder, distal part of ureter, uterus, Fallopian tube & LN.

② radiotherapy :- if no metastasis

③ chemotherapy: if metastasis.

T<sub>4</sub> → palliative radiotherapy, systemic chemotherapy (cisplatin)

**NB: Urinary diversion (UD):** done by

① - reversible UD :- as suprapubic catheter.

② irreversible UD :- urethro catheterostomy.

- transurethroscopy

- ileal loop (implant ureter in ileum)

- ileo-cystoplasty [40 cm of ileum, cut ms to ↓ pressure, connect edges to ↑ reservoir.

[complication is electrolyte disturbance as bowel absorb electrolyte so not done if pt > 70 yr]

→ no reflux as bowel low pressure

## \* investigation of bladder ca :-

- laboratory :- urine cytology, blood exam.

- Radiology: KUB (calcification in sq. c.c.), US, CT, IVU, ascending cystography

- instrumentals: cystoscopy (imp for biopsy, visualisation)

- look for metastasis.



# URINARY CALCULI "STONES" "UROLITHIASIS"

(29) UROLOGY

\* **Incidence**:- common, affecting  $\approx$  <sup>4%</sup> 10-20% of population affecting middle aged male > female. (3:1)

\* **Aetiology**:- not exactly known:- <sup>30s</sup> in children ♂=♀  
---third most common after UTI & BPH

- ① Geography:- tropical & desert more affected
- ② Climate & seasonal:-  $\uparrow$  temp  $\rightarrow$  conc. urine  $\rightarrow$   $\uparrow$  stone.
- ③ Water intake:  $\uparrow$  intake  $\rightarrow$   $\uparrow$  output urine  $\rightarrow$   $\downarrow$  stone.
- ④ Diet:-  $\uparrow$  stone formation by  $\uparrow$  food rich in:-
  - Oxalates (e.g. spinach, tomatoes & mango).
  - Uric acid (e.g. liver, kidney, sardines, salmon).
  - Calcium (e.g. milk & milk products).
- ⑤ Occupational:-  $\uparrow$  in sedentary work (doctors)  $\downarrow$  in farmers.
- ⑥ Drugs:- acetazolamide, vit D, hydrochlorothiazide  $\rightarrow$   $\uparrow$  stone.
- ⑦ Congenital anomalies:-  $\uparrow$  stone formation e.g. horseshoe kidney
- ⑧ Urinary tract obstruction  $\rightarrow$  stasis  $\rightarrow$  infection  $\rightarrow$  stone.
- ⑨ Infection  $\rightarrow$  nucleus for stone form. (by pus cell, epith cell.  
also infection change pH {phosphate ppt in alkaline urine  
but oxalate, uric acid & cystine in acidic urine}
- ⑩ Metabolic & endocrine factors (vary @ type of stone) e.g.
  - Ca oxalate & Ca phosphate stones  $\rightarrow$  RTA, hyperparathyroidism, sarcoidosis  $\rightarrow$  hypercalcemia, also cong. & acquired hyperoxaluria
  - Uric acid calculi  $\rightarrow$  hyperuricaemia (gout), hyperuricosuria.
  - Cystine calculi  $\rightarrow$  hereditary cystinuria.
  - Xanthine calculi  $\rightarrow$  hereditary xanthinuria.

\* **Theories for stone formation**:-  $\rightarrow$  1-hypersaturation 2-nucleus 3-stasis

- ① Nucleation theory: presence of nucleus e.g. FB, debris, clot...etc
- ② Crystallization theory (over solubility of one or > element  $\rightarrow$  crystal).
- ③ Inhibitory theory: some pt have risk factors but no stone formed  
believed to have inhibitory factors for stone form. in their urine

- Recurrence rate 50-80 % pt called stone former or stone passer

- Stones are 12 % radiolucent ( 88% radioopaque)

$\rightarrow$  uric acid stone  
cystine, xanthine  
& salicylate

$\rightarrow$  Ca-oxalate  
Ca-phosphate  
triple stone



## \* Types of urinary stones :

|               | Oxalate                       | Phosphate                                                        | Uric acid            | cystine                   | Xanthine  |
|---------------|-------------------------------|------------------------------------------------------------------|----------------------|---------------------------|-----------|
| incidence     | <u>75%</u> 60%                | 15%                                                              | <u>5%</u>            | 3%                        | 2%        |
| chemistry     | ca. oxalate                   | ca. phosphate or with ammonium & Mg phosphate "triple phosphate" | uric acid            | non-essential amino-acids | xanthine  |
| Number        | single                        | single or multiple                                               | Multiple             | Multiple                  | Multiple  |
| size          | Moderate                      | Large (may staghorn stone take pelvis shape)                     | small                | small                     | small     |
| surface shape | spiky & irregular             | smooth                                                           | smooth & may faceted | smooth                    | smooth    |
| Colour        | brown or black by bd. pigment | Dirty white<br>(normal colour of oxalate white)                  | yellow to red brown  | yellow & by air green     | yellow    |
| Consistency   | very hard                     | chalky, friable                                                  | hard                 | soft                      | soft      |
| Cut section   | No nucleus<br>No laminae      | nucleus, laminae                                                 | No                   | No                        | No        |
| x-ray         | radio-opaque                  | radio opaque                                                     | Pure → radiolucent   | radioopaque               | r. lucent |

## \* Clinical pictures :-

easily fragmented by ESWL

- Silent e.g renal & bladder stones.
- Pain : by movement of stones (fixed if renal, colicky in ureter)
- Haematuria, pyuria (by recurrent UTI)
- Urine retention, nausea, vomiting.
- In prostatic calculi → Painful ejaculation, haemospermia.

## \* Complications (effects) of stones :-

- 1- obstruction.
- 2- Haematuria
- 3- Infection
- 4- Migration
- 5- Malignancy :- chr. bladder stone → sq. cell. ca.
- 6- Back pressure :- hydro ureter, hydronephrosis.
- 7- Calcular anuria.
- 8- May be Nil (found accidentally).



## \* Investigation of stones :-

### [A] Laboratory :-

- Urine analysis (crystal, Pus cell, RBC, colour, glucose, --etc) culture
- Blood exam (CBC,  $Ca^{++}$ , RFT, --etc), serum creatinine.

### [B] Radiological :-

- Plain abd. X-ray  $\rightarrow$  (KUB)  $\rightarrow$  radio opaque shadow. (90% radio opaque)

D/D of shadow :- ① GB stone ② FB in GIT ③ bd clot  
④ old TB kidney ⑤ calcify thrombus ⑥ cyst ⑦ tumours

- U/S, CT scan :- diagnostic.  $\rightarrow$  Contraindicated in hypotensiv pt due to peripheral VC
- IVU :- not done during attack, it shows obst., radiolucent stone, funx. of other kidney. (filling defect)
- Cystoscopy in bladder stone also to take biopsy.

## \* Management of stones :-

- It depends on size, shape, No., site, of stone, also condition of pt & presence of underlying cause.
- e.g size :- if stone  $< 0.5$  cm :- 93% pass spontaneously.
  - 0.5 - 1 cm: 5% " "
  - $> 1$  cm: never pass. need Rx.

### ① Conservative (Medical) ttt :- by

- analgesia, high fluid intake, diuretics, antibiotics.

### ② Intervention :- if failed medical or in :-

- Kidney stone: if symptomatic, obst PUS, staghorn stone, solitary kidney, recurrent infection.
- Ureteric stone: if fail to pass large ( $> 1$  cm), obst., infection.
- bladder stone :- all bladder stone must be removed.

### \* Methods of intervention are :-

kidney stone  $> 2$  cm  
ureter stones  $> 1$  cm

### (A) Renal stones :-

- ESWL "Extracorporeal Shock Wave Lithotripsy"  
for small & medium sized, if good renal funx. & if  $\bar{t}$  no blood disease & not stenotic pt.

Contraindications :- 1- pregnancy  
2- uncontrolled coagulopathy } absolute  
3- distal obstruction  
4- febrile infection



### 10 PCNL "Percutaneous nephroLithotomy"

- It is endoscopic lithotripsy or extraction → using nephroscopy passing renal pelvis percut. & grasping stone by forceps or fragmented by uls (if large)  
{ can be fragmented by uls, electrohydraulic or Laser Lithotrites } then extract fragments
- complications of PCNL :- Hge, extravasation of urine, injury to colon, pleural cavity.

### 10 Open surgery "nephroLithotomy" by :-

- pyelo lithotomy, extended pyelolithotomy, nephrolithotomy, partial nephrectomy or nephrectomy.
- ~~AVB~~ :- if bilateral operate kidney of better funx first.  
if bilateral both good operate one with pain (obst)

### (B) Ureteric stones :-

- 10 ESWL :- in stones of upper ureter, if stone can't be localized by fluoroscopy (as if contact vertebra) push it back to renal pelvis by uretroscopy & do double J stent insertion & refer pt to ESWL.
- 10 Endoscopic removal in lower ureter by :-  
(Lithotripsy, dormia basket or meatotomy.)
- 10 Open surgery "uretero lithotomy."

### (C) bladder stone :-

- 10 Litholapaxy :- endoscopic crushing of stone & do lavaged removal of stone. (done for stone < 2cm)
- 10 Surgical (for > 2cm) and for multiple stone, stone at diverticulum, failure of litholapaxy of neck obstruction  
- surgery by cystolithotomy (by midline suprapubic incision)  
→ for large stone

### (D) Urethral stone :-

- Prostatic :- pushing it to bladder by catheter and Rx as above.
- Membranous :- by urethroscopal removal (forceps) and if failed Urethrostomy.



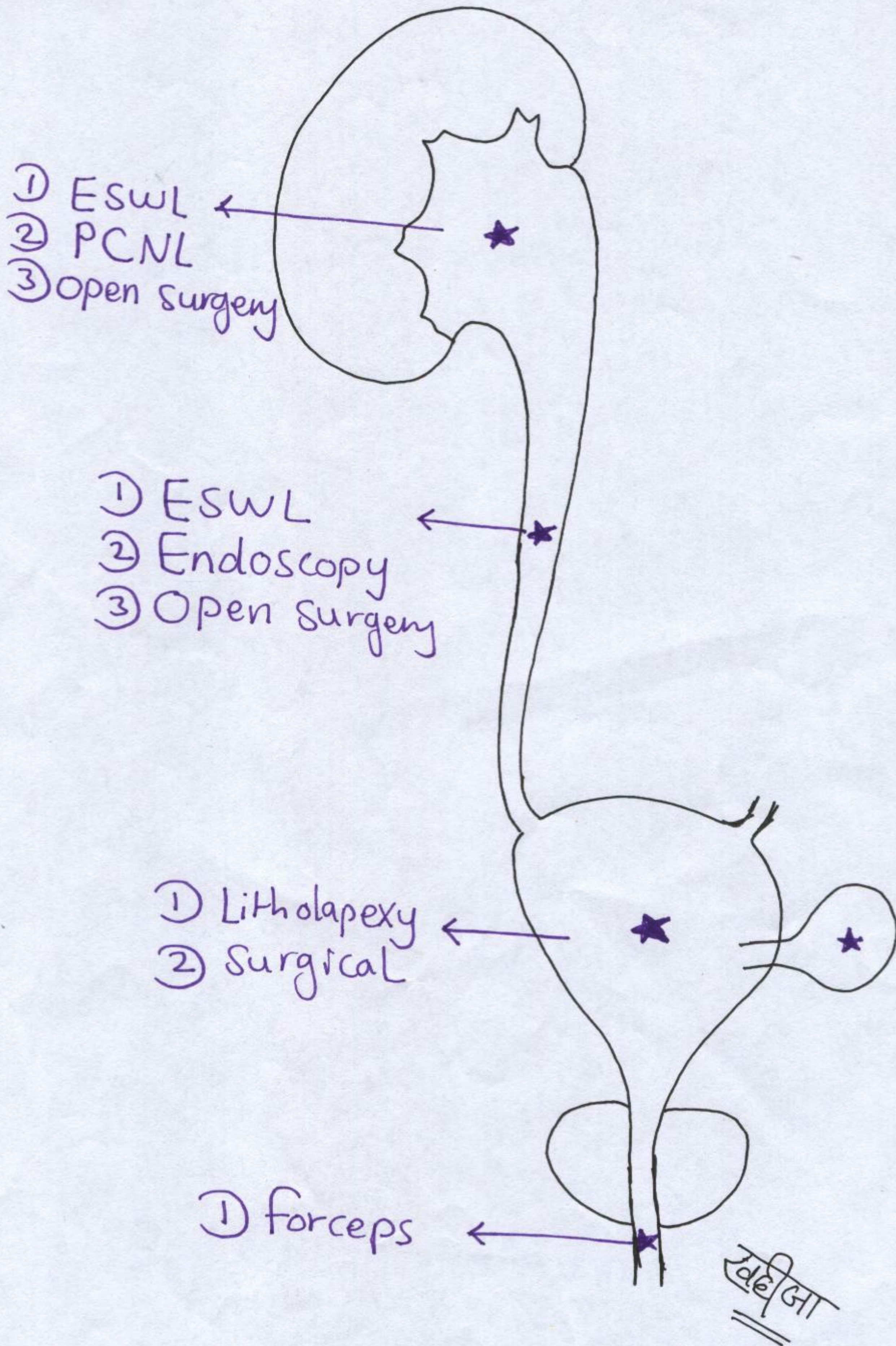
| रविवर | ESWL                                                                                                                                                                                                                                          | PCNL                                                                                                                                                                                                                                                                                  |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|       | <p>[[Extracorporeal Shock wave lithotripsy]]</p> <ul style="list-style-type: none"> <li>• In small &amp; medium sized stone</li> <li>• Direct contact w skin</li> <li>• pt should be naked</li> <li>• No bone b/w stone &amp; ESWL</li> </ul> | <p>[[percutaneous nephrolithotomy]]</p> <ul style="list-style-type: none"> <li>• In nephro &amp; caliceal stones.</li> <li>• pt on his Abdomen, Anaesthesia</li> <li>✓ Nephrostomy</li> <li>✓ Dilators</li> <li>✓ Nephroscopy</li> <li>✓ wide nephrostomy tube after PCNL.</li> </ul> |
| Comp  | <ol style="list-style-type: none"> <li>① Hematuria</li> <li>② perinephric Hematoma</li> <li>③ Steinstrasse (Street stones)</li> <li>↳ accumulation of multiple stones in ureter</li> <li>④ UTI</li> </ol>                                     | <ol style="list-style-type: none"> <li>① bleeding</li> <li>② infection</li> <li>③ A-V Fistula</li> <li>④ injury to adjacent structures (rare)</li> <li>⑤ Residual stones</li> </ol> <p>↳ R ESWL.</p>                                                                                  |
| C/I   | <ol style="list-style-type: none"> <li>① pregnancy</li> <li>② uncontrolled coagulopathy</li> <li>③ uncontrolled HPT</li> <li>④ Heavy weight 250-300kg</li> <li>⑤ Calcified aortic aneurysm</li> </ol>                                         |                                                                                                                                                                                                                                                                                       |

\* Rx of stones according to site & size:

- ① Calyceal stone & nephro → beyond surgery we do IVU
  - if < 2.5 cm → Double J stent + ESWL
  - if > 2.5 cm → PCNL
- ② Upper ureteric stones: ♂ ESWL, ♀ URS (ureteroscopy)
- ③ Middle & lower ureteric stones: ♂ URS, ♀ URS
- ④ Urethral stones → Rx push the stone back to bladder then do stone crushing via Catheter.
- ⑤ Staghorn Stone: Rx Sandwich therapy (the best)



# Max Urolithiasis





# URINARY INCONTINENCE

د. ابو حجر

## \* Definition:-

- Involuntary passage of urine <sup>with social and hygienic problems</sup> or inability to control micturition

## \* Types:-

### ① Stress incontinence:

when intravesical pressure > maximal urethral pressure in absence of detrusor instability

- Involuntary loss of urine associated w physical activity such as coughing, laughing, sneezing, lifting or exercise.
- It is due to ↑ intraabd. pressure w → ↑ intravesical pressure & out fling pr. in proximal urethra → urine loss.
- It is more common in female esp. multipara due to short wide urethra, weakening pelvic floor
- It can occur in old obese male post traumatic as prostatectomy esp. "TURP" (→ difficult to treat here)

### ② overflow incontinence: <sup>occur in menopause (due to decrease oestrogen) and following denervation of pelvic floor ms</sup>

- It is passage of urine due to ↑ volume inside bladder (w fails to empty normally) without contraction
- It is caused by bladder outlet obstruction, detrusor weakness or combination of both.
- The bladder dilated, hypertrophied but no contraction so volume ↑ → when reach about 1000 ml the hydrodynamic pressure → urine incontinence so there's chronic retention & overflow incontinence.

### ③ Urge incontinence (involuntary loss of urine preceded by urgency)

- It is due to involuntary ↑ in intravesical pressure 2<sup>nd</sup> to detrusor cont. w overcomes outlet resistance → urgency of urination, so bladder at 1<sup>st</sup> stable & when urine reaches 250 ml or less → ⊕ & contraction → incontinence.



- The causes of detrusor instability are:-

- [a] loss of cortical inhibition as after stroke, dementia, DM, cold & parkinsonism
- [b] Local causes: cystitis (most common), bladder stone, tumour (ca-is) foreign body.

### ③ Nocturnal enuresis:

- It means bed wetting at night
- Enuresis means involuntary wetting in children, it is common problem may be due to ① developmental lag in inhibitory impulses of CNS ② behavioral or stress factors.
- It is of 2 types
  - [a] Primary enuresis - child who is wet since birth, it usually resolve around 2<sup>nd</sup> or 3<sup>rd</sup> year of life.
  - [b] Secondary enuresis: who had period of dryness. Spontaneous resolution is expected w/ parenteral reassurance, toilet training & fluid restriction before bed time

ttt: Tophranin (TCA)  
Minirin (ADH)

### ④ Fistula incontinence (Total incontinence)

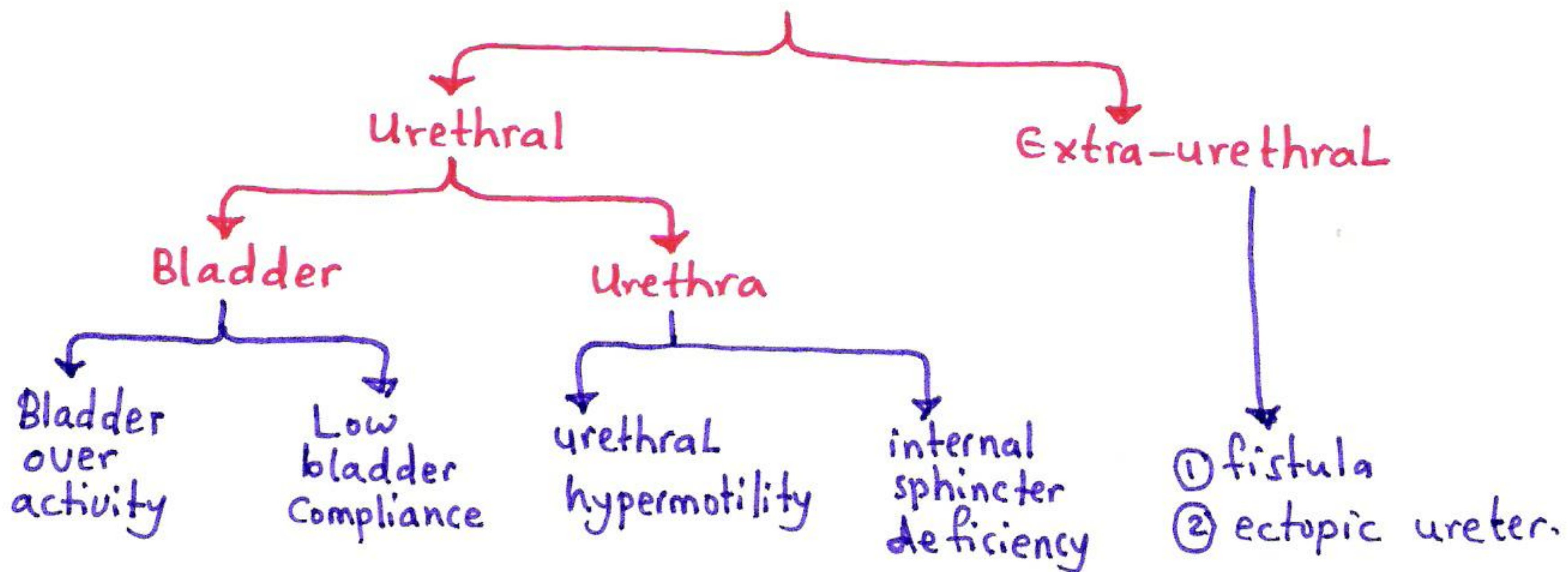
- It is incont. through fistula e.g. ca colon, Ceaserian section ... etc

### \* Common causes of urine incontinence :-

- |                              |                                                                                                 |
|------------------------------|-------------------------------------------------------------------------------------------------|
| ① trauma → pelvis            | ⑥ Congenital: e.g. ectopic vesicle.                                                             |
| ② infection → cystitis       | ⑦ Capacity problem → TB, radiotherapy                                                           |
| ③ endocrine → thyrotoxicosis | ⑧ Neurological → MS, spinal cord lesion<br>parkinsonism                                         |
| ④ psychological.             | ⑨ Drugs → anti Hrt, anti cholinergic<br>lithium, tricyclic antidepressants<br>& phenothiazides. |
| ⑤ neoplasm → ca invasion     |                                                                                                 |



## \* Classification of incontinence :-



### \* Bladder overactivity :-

- Sudden contraction of detrusor ms without neurogenic problem.  
(NB:- detrusor instability usually due to specific infection as T.B , bilharziasis  $\rightarrow$   $\downarrow$  compliance).  $\textcircled{ttt}$  medical  $\rightarrow$  Ditropan = oxybutinin 10-15 mg/day  
s/e: mouth dryness

### \* Low bladder compliance :-

- because  $\downarrow$  bladder capacity  $\rightarrow$   $\uparrow$  volume  $\rightarrow$   $\uparrow$  pressure  $\rightarrow$  incontinence.  
 $\textcircled{ttt}$   $\rightarrow$  augmentocystoplasty.

$\rightarrow$  Tolterodine 10 mg/day  
 $\rightarrow$  pelvic floor exercise once

### \* Urethral hyper-motility :-

- In stress incontinence , abnormal descend of bladder neck by  $\uparrow$  intraabdominal pressure  $\rightarrow$   $\uparrow$  intravesical pressure  $\rightarrow$  rotational descend of pelvic organs which is not transmitted to proximal urethra  $\rightarrow$  reversal pressure  $\rightarrow$  incontinence.

$\textcircled{ttt}$  - colpo suspension (to prevent descend & backboard rigidity)

### \* Internal sphincter deficiency :-

- Unknow pathology.  $\textcircled{ttt}$  :- sling  $\rightarrow$  TVS (transvesical sling)

### \* Fistula :-

- caused by :- 1- chronic infection 2- malignancy  
3- Radiotherapy 4- surgery.  
4- Prolonged 2nd stage labour  $\rightarrow$  b/c head of baby press bladder wall  $\rightarrow$  pressure necrosis  $\rightarrow$  fistula.



**[NB]**:- male incontinence indicate serious condition.

**[NB]** - during severe cystitis U.B sends impulses to CNS as it is full  $\rightarrow$  feeling of retention with empty bladder by U/s.

**[NB]** - Nerve supply of U.B :- pontine micturation centre (voluntary)  
 - peripheral N/s by  $\begin{cases} \text{symp} \rightarrow \text{incontinence} \\ \text{Parasymp} \rightarrow \text{retention} \end{cases}$   $\leftarrow$  central  $\leftarrow$  autonomic somatic  
 .. S2.3.4 "reflex"

**[NB]** - before 1<sup>st</sup> year of age micturation occur by sudden contraction of bladder wall & relaxation of sphincter without control (as spinal cord still unmyelinated.).

**[NB]** - Detrusor external sphincteric dysnergia "DESD" :-  $\rightarrow$  hypertrophy of detrusor  $\rightarrow$  trabeculation  $\rightarrow$  diverticulum.

**[NB]** - Phases of micturation are:-

① storage phase  $\rightarrow$  by inhibitory impulse to bladder wall & excitatory to sphincter.

② Micturation phase  $\rightarrow$  start at any drop pass to prostatic urethra  $\rightarrow$  contraction of detrusor ms & relaxation of the sphincter

\*Approach to pt  $\in$  incontinence:-

\*History :- type of continence, severity, course, past medical & surgical history, neurological problems, drug (diuretic, antidepressant).

\*Examination:- examine suprapubic area (mass, fistula, etc)

- P/R for prostatic & rectal mass, neurological exam.

\*Investigations ① Urine analysis

② u/s  $\rightarrow$  bladder capacity & residual volume

③ Urodynamic study.

④ Uroflow meter  $\rightarrow$  outflow meter - normal bell shaped curve

- the top of bell is maximum flow rate (QM)

- QM - female 20-50  $\rightarrow$  short urethra

- male 10-15

⑤ Electromyograph (EMG):-

study electricity of ext. sphincter to correlate outflow meter & urodynamic study.





# URINARY TRACT INFECTION

## UTI

(52) URO

### \* DEFINITION :-

- Inflammatory response of urothelium to bacteria that is usually associated  $\bar{e}$  bacteruria.
- It is the 2<sup>nd</sup> commonest infection of body (after URTI)
- It is commoner in females & old age.

### \* CLASSIFICATION :-

#### • according to site of origin:-

- ① Upper UTI :- pyelonephritis, renal <sup>& perirenal</sup> abscess, pyonephrosis.
- ② Lower UTI :- cystitis, urethritis, prostatitis, orchitis, epididimitis.

#### • according to duration:-

- ① Acute UTI.
- ② Chronic UTI.

#### • according to causative agent:-

- ① Specific UTI :- eg TB, Bilhaziasis.
- ② Non-specific UTI : eg pyogenic UTI.

#### • according to process of development:-

##### ① Isolated infection:-

- the duration from previous infection at least 6 months.
- occurs in 25% of women between 30-40 yr.

##### ② Unresolved infection:-

- Due to inadequate therapy, resistant bacteria, or low pt immunity or presence of source or cong. anomaly.

##### ③ Recurrent UTI :- either:

(a) Reinfection - recurrent UTI  $\bar{e}$  different bacteria.

- about 95% of all recurrent UTI are reinfection in ♀.

(b) Bacteria persistence:- recurrence  $\bar{e}$  same organism from focus inside urinary tract eg stone, FB, fistula or anomalies as ureteral duplication, --- etc.



**\* PATHOGENESIS:** E-coli commensal  $\rightarrow$  85% of community acquired  
 $\rightarrow$  50% of hospital acquired

**● Routes of infection:-**

① Ascending route:-

- the commensal route, from faecal reservoir via urethra  $\rightarrow$  bladder  $\rightarrow$  ureter if there is reflux which may be caused by oedema in cystitis or by the interfere  $\bar{e}$  ureteral peristalsis (eg pregnancy, G-ve infection & obstruction).

② Haematogenous route:-

- Uncommon, from septic focus in body by staph aureus --- etc.

③ Direct (lymphatic) route:-

- Due to appendicitis & appendicular masses.

**● Predisposing factors for UTI:-**

① Stagnant urine:-

- forms excellent culture media for growth of bacteria.
- Caused by infrequent voiding, obstruction, stones ---- etc.

② Source of organism:- e.g stone, FB

③ others:- low immunity, source of reinfection (fistula --- etc)

**\* DIAGNOSIS:-**

① Urine analysis:-

- Indirect dipstick test.
- Microscopic & Macroscopic.
  - In female may  $\bar{e}$  false +ve (Lactobacilli & corynebacteria)
- Urine culture & sensitivity.
  - Colony count  $> 10^5$  organisms/ml is significant bacteriuria.

② Imaging technique:- (in special cases)

- KUB, renal tomography, excretory urogram, voiding cystourethrogram, U/S & radionuclide study (if there is suspicion of abscess not clear by U/S or CT scan).
- (also radionuclide may not be useful in acutely ill pt as Gallium needs 48 hr & Indium 24 hr after injection)



## i. PYELONEPHRITIS

### (A) ACUTE PYELONEPHRITIS :-

- Acute bact. infection of one or both kidneys.
- More in ♀, more on right & is frequently bilateral.
- Common inf childhood, puberty, after marriage (honeymoon), pregnancy & during menopause.
- E. coli is commonst organism 60%.
- E. coli, stæpt. faecalis occure in acidic urine while staph, klebsella, proteur & pseudomonas in alkaline urine.
- Occurs 1<sup>st</sup> at renal pelvis & then involves calyx, pyramid and some of paranchyma.

### \* Predisposing factors

- ① vesicoureteric reflux.
- ② obstruction of UT.
- ③ Short urethra (♀ more b/c short wide urethra).
- ④ Neurogenic bladder → ↑ intravesical pressure → upper tract (ascend)
- ⑤ Low immunity :- DM, HIV, ... etc
- ⑥ Iatrogenic : e.g catheterization

in DM → low immunity  
→ sloughed papilla → obst  
→ bladder dysfunction

### \* Clinical picture :-

- ① Acute pain at flank & hypochondrium.  

D/D ⇒ ureteric colic, acute appendicitis, acute pancreatitis, acute cholecystitis, diverticulitis, Pelvic inflm. disease
- ② high pyrexia with rigor & tachycardia.
- ③ Generalized malais, anorexia, headache, vomiting.
- ④ Haematuria.
- ⑤ s/s of cystitis (as infection usually ascending).
- ⑥ O/E → pt looks ill, toxic, dehydrated, tender loin, tachycardia, high fever (39-40°) shivering, ± uremia.



### \* Investigation :-

- ①- CBC (leukocytosis), ~~RFT~~, U/E/C, ... etc.
- ②- Urine analysis  $\rightarrow$  PH, microscopic, C/S, ... etc.
- ③- KUB & U/S to exclude cause (stone, abscess ... etc).
- ④- Micturating cystogram  $\rightarrow$  Mandatory to exclude vesico-ureteric reflux in children  $\bar{e}$  recurrent pyelonephritis.

### \* Treatment :-

- ①- Complete bed rest, analgesia, antipyretic.
- ②- I.V fluid ( $\approx$  3 L/24 hr).
- ③- I.V antibiotic; start by anti G-ve  $\bar{e}$  high tissue perfusion  
e.g. Augmentin (amoxil + clavulanic acid), cephalosporine, & Gentamycin (Aminoglycoside) (but nephrotoxic, ototoxic).  
- Continue until pt improved clinically & pyrexia  $\rightarrow$  followed by 2 week course of oral antibiotic.
- ④- Neutralize urine e.g. give Na-citrate for acidic urine or ammonium chloride for alkaline urine.

## Ⓑ CHRONIC PYELONEPHRITIS

- Condition in w active infection is not determined but there is parenchymal scarring of kidney.
- Occure mainly in pt  $\bar{e}$  v.u. reflux., (3 ♀ : 1 ♂).
- Usually a symptomatic, may presented at adulthood by uremia & hypertension.
- Some cases presented by ① Lumbar pain (dull) ② pyrexia (low grade fever) ③ frequency & dysuria ④ malaise, anorexia, nausea, uremia, headache, HTN.

### \* Investigation :-

- CBC, proteinuria (not  $>$  3g daily bec. glomeruli relatively preserved)
- Urine analysis, C/S, U/S, IVU. (renal scarring, dilated calyces small kidney & other one hypertrophied if unilateral but if bil. both small).



NB: Acute pyelonephritis never change to chronic one.

### \* Treatment :-

- ① Eradication of predisposing cause (stone, obst. .... etc).
- ② Antibiotics (only temporary benefit as progressive renal damage is common).
- ③ In unilateral disease → nephrectomy to stop infection & control hypertension.
- ④ In bilateral → haemodialysis or transplantation.

## ii. PYONEPHROSIS

### \* Definition

= chronic retention of infected urine ; can result from infection of hydronephrosis.

### \* clinical picture

- classic triad → anemia, fever & swelling.
- symptoms of cystitis may present

### \* Investigation :-

- Laboratory:- urine analysis, c/s, u/e/c, CBC, blood culture.
- Radiological:- KUB, U/S, IVP, cystoscopy.

(NB Ascending pyelography is done if IVP contraindicated due to bad renal function.)

### \* Treatment :-

- 1- I.V antibiotic given immediately.
- 2- Drainage by percut. nephrostomy or open nephrostomy.
- 3- removal of cause e.g stone.
- 4- nephrectomy if kidney destroyed & other good.



### iii-RENAL ABSCESS "carbuncle"

• Abscess in renal parenchyma, typically from focus of pyelonephritis (E. coli) or hematogenous (staph aureus)

#### \* Pathology :-

- encapsulated necrotic mass in parenchyma, it may rupture → Perinephric abscess.
- commonly seen in diabetic, AIDS pt ... etc.

#### \* Clinical picture :-

- If hematogenous spread → pyrexia, rigor, flank pain & swelling, tenderness (No H/O UTI, bacteriuria).
- If result from pyelonephritis → usually multifocal involving both medulla & cortex, presents as above + history of UTI, bacteria, stone.

#### \* Investigation :-

- ① CBC, ESR ... etc
- ② U/S, CT scan, IVU (space-occupying lesion)
- ③ confirmed by percut. needle aspiration.

#### \* Treatment :-

- ① Strong I.V antibiotic e.g. fucidine
- ② Drainage → Percutaneous nephrostomy or open surgery.

### iv-PERINEPHRIC ABSCESS

• Lies between renal capsule & perirenal (Gerota's) fascia.

#### \* Aetiology:

by E. coli or staph.

- ① extension or rupture of renal abscess.
- ② infection of perirenal haematoma.
- ③ hematogenous or lymphatic from GIT e.g. appendicitis.

#### \* predisposing factors:

old age, trauma, low pt immunity.



### \* C/P of perinephric abscess :-

- 1- high swinging pyrexia.
  - 2- Sudden severe lumbar pain & rigors.
  - 3- fullness of loin.
  - 4- o/e :- pt looks ill, dehydrated, & tender & rigidity at renal angle.
- usually no s/s of cystitis (urine is clear).

### \* Investigation :-

- 1- CBC, ESR, blood analysis ( $\uparrow$  urea). U/E/C
- 2- U/S, CT scan, confirmed by aspiration.

### \* Treatment :-

- 1- Admission, IV fluid, IV antibiotic, analgesia, antipyretic.
- 2- If no improvement in 24-48 hrs  $\rightarrow$  drain abscess surgically (percut. or open).

## V-CYSTITIS

### \* Definition :-

- = Infection of urinary bladder, the most common UTI.
- = Common in  $\phi$  (short wide urethra) (vaginal discharge, pregnancy)
- = Caused by E. coli (80%)

### \* Predisposing causes :-

- 1- incomplete bladder emptying.
- 2- Presence of stones, FB, --- etc.
- 3- Others :- low immunity, oestrogen deficiency ( $\downarrow$  <sup>Local</sup> resistance).

### \* Route of infection :-

- 1- Ascending :- urethral contamination  $\rightarrow$  Most common route.
- 2- Descending :- from kidney through ureter.
- 3- Haematogenous & lymphatic spread. & adjacent structures.



\* C/P of cystitis :-

- 1- irritative symptoms :- frequency, dysuria, urgency, urgent incontinent.
- 2- Suprapubic & low back pain.
- 3- Pyuria (usually present), hematuria & pyrexia (infrequently).
- 4- O/E no physical finding except tenderness.

\* Investigation :-

- 1- CBC, urine analysis (midstream urine), macroscopic → cloudy, smells fishy, microscopic → bacteria, c/s.
- 2- KUB (exclude stone),
- 3- U/S, IVU, cystoscopy (after acute phase).

\* Treatment :-

- 1- Bed rest, drink a lot of water (irrigate bladder & dilute urine)
- 2- analgesics, alkalinization of urine.
- 3- Antibiotic as nalidixic acid or nitrofurantoin

\* complication :-

- 1- ascending of infection → kidney (esp. if V.U reflux)
- 2- septicemia & pyemia in low immunity pt.

NB:- Asymptomatic bacteraemia:-

presence of  $>10^5$  organisms/ml of urine in absence of symptoms  
- no need for Rx except if

- ① children  $<10$  yr (as kidney grows mainly in 1st 10 yrs)
- ② Primary gravida :- (as pregnant more prone to pyelonephritis → premature, small for date, preeclampsia...etc)

NB:- Bacteria :- presence of bacteria in urine (normally urine sterile)

- pyuria :- presence of WBCs in urine
- Bacteruria  $\neq$  pyuria indicate colonization rather than infection.
- pyuria  $\neq$  bacteruria indicate TB, stone, malignancy
- Nosocomial infections :- are infections acquired at least 72 hrs after hospitalization, frequently by *E. faecalis*, *Kleb. enterobacter*, *Citrobact.*, *Pseudomonas*, *Serratia* & *St. epidermidis*



## VI - URETHRITIS

### A) Non-specific urethritis: (60-70% of cases).

- common in both sex, related to sexual activity.
- caused by chlamydia trachomatis (40%), Trichomonas vaginalis, ureoplasma urealytica & candida albicans.
- C/P:- dysuria, urgency, pruritis at meatus (may asympt.)
- Treated by Tetracyclin & erythromycine.

### B) Reiter's disease:

- venereal disease characterized by :- Urethritis, arthritis & conjunctivitis.

### C) Gonorrhoeal urethritis.

- Diagnosed by culture of urine (NB chlamydia that cause non specific urethritis is difficult to culture).

### NB: ANTIMICROBIAL DRUGS:

- Trimethoprim - sulphamethoxazole "Tmp-Smx":-
  - have synergistic bactericidal effect, effective against most organisms except enterococci, pseudomonas
  - inexpensive, → skin rash & GIT symptoms.
- Nitrofurantoin:-
  - effective against most organisms except pseudo & proteus
  - Not useful for upper tract & may → infertility.
- Ampicillin:-
  - affect normal flora, may → candida vaginalis.
  - may predispose to reinfection & resistance strains.
- Aminoglycosides: (Genta)
  - When combined & (Tmp-Smx) or (ampicillin) is the 1<sup>st</sup> choice ttt for febrile UTI.
  - Nephrotoxic & ototoxic.
- Fluoroquinolone:-
  - highly effective against enterobacteria, s. aureus, p. aeruginosa
  - resistance by anaerobic bacteria.
  - It damage developing cartilage



## (I) - RENAL TB

- It is 2<sup>nd</sup> to 1<sup>st</sup> lesion from lung (by hematogenous.)

### \* Pathology :-

- It is usually confined to one kidney, usually close to glomeruli (foci of granulomas).
- The group of TB granulomas in renal pyramid coalesce to form ulcer → Urine discharge of mycobacteria & pus cells.
- If untreated, the lesion enlarge & TB abscess formed in parenchyma → later fibrosis → pyonephrosis → perinephric abscess, and the kidney is progressively replaced by caseous material → calcified cement kidney and plain x-ray shows area of calcification
- In case of massive calcification nephrectomy is advised.
- Renal hypertension is frequently seen due to occlusion of renal artery or due to parenchymal atrophy

## (II) - URETER TB

- It is 2<sup>nd</sup> to renal TB & mostly in lower ureter (ie the uretero-vesical junction) → uretero-hydronephrosis → renal damage.

## (III) - BLADDER TB

- It is 2<sup>nd</sup> to renal TB & <sup>always</sup> ~~mostly~~ around ureteric orifice which may → ureteric stenosis or reflux → bladder TB ulcer (late, irregular edge, superficial & central inflamed area)
- The ulcer may become deep, heals by fibrosis → ↓ the bladder capacity
- NB :- TB in bladder always near ureteric orifice, if seen away from orifice malignancy is suspected → take biopsy.
- If involves seminal vesicle & fistula → cystectomy indicated.



#### (IV) GENITAL TB

##### \* TB testis:-

- Usually 2<sup>nd</sup> to TB of epididymis & 12% of cases have renal lesions on autopsy.

##### \* TB epididymis:-

- It is mostly blood born metastasis & one out of 12 cases associated  $\bar{e}$  renal TB
- presented by painfull scrotal swelling, sinus discharge
- It is bilateral in 34% of cases.

##### \* C/P OF G. URINARY TB :-

- 1- Urgency.
- 2- Frequency.
- 3- Haematuria.
- 4- dysuria (Latest symptom)  $\rightarrow$  by urethral spread or 2<sup>nd</sup> infection.
- 5- Pain is late & rare symptom.  
s/s appears 1<sup>st</sup> by night time then by day time.

• It is very rare in children (no urinary TB recorded < 10 yr) because:-  
1- chronic dis takes 3-10 yrs.  
2- renal complication rare in children

##### \* INVEST. OF TB :-

- 1- Bacteriological :-  $\rightarrow$  microscopic & culture.
  - 2- Urine examination.
  - 3- TB test.
  - 4- CBC, ESR, RFT.
  - 5- plain abdominal & chest x-ray  $\rightarrow$  KUB.
  - 6- IVP, cystoscopy & bladder biopsy.
- **[NB]** - Urine is sterile  $\bar{e}$  pus cells over 20/HPF  
- Microscopic hematuria present in all cases but  
Macroscopic hematuria present in 10% of cases.

##### \* TREATMENT OF TB

- Anti TB drugs & surgery in complicated cases.



# RENAL FAILURE & TRANSPLANTATION

## RENAL FAILURE

### Acute renal failure

\* **Definition:** - condition in w GFR abruptly reduced.

\* **Causes:** ① prerenal :- due to ↓ renal perfusion: by:

- hypovolemia, low CO, renal a. stenosis or occlusion

② renal :- due to parenchymal renal dis. as:

- Acute glomerulonephritis.

- Acute interstitial nephritis.

- Acute tubular necrosis by

• nephrotoxins: as aminoglycoside, anesthetic iodinated contrast, NSAID.

• Ischemic injury

• Haemoglobinuria, myoglobinuria.

③ Post renal: due to obstruction of urine flow.

\* **Treatment:** treat underlying cause

- if failed dialysis &  hepatitis. AIDS  
social problem, expensive

- renal transplantation may indicated. (end stage RF)

## RENAL TRANSPLANT.

- It is an effective Rx for end-stage renal dis. (ESRD) which causes irreversible renal disease.

\* **Type of donors:**

① Cadaveric donors:-

- criteria of donors are: age 5-55 yrs, from pt with brain death, free of past medical history



(7)

- Kidney taken by EN-block resection (both kidney segment of aorta & IVC) & put in Ringer lactate solution  $4^{\circ}\text{C}$  to stop metabolism.

## ② Living donor:-

- criteria for donor are: age ~~18-60~~ yrs { older than have atherosclerotic vessels, younger can't withstand higher bd pressure }.
- general health of donor should be good with optimum function, no malignancy, HTN, DM, sepsis or familial renal dis, ABO & HLA compatibility and tissue matching "histocompatibility" imp.
- must do renal angiography to assess renal vessel, if any hot area (inflamm), cold area (fibrosis)
- also IVP to assess kidney funx.

## \* Contraindication of renal transpl. :-

- |               |                           |
|---------------|---------------------------|
| 1- old age    | 4- uncontrolled HTN or DM |
| 2- UTI        | 5- septic focus.          |
| 3- malignancy |                           |

## \* procedure :-

- The kidney transplanted in Rt iliac fossa by incision in Rt lower quadrant (parallel to ing lig.)
- renal artery anastomosed to iliac vessels { by end to side in common iliac or end to end in int iliac }
- renal vein to IVC, ureter implanted to bladder.
- before transplantation, kidney washed & should function extracorpally, perfused w/ urocholine solution to wash bd & open nephrons.
- after transpl. kidney should work while pt on table if delay (spasm or obst in anastomosis) kidney treated by hotness.



(8)

- The original kidney is not removed unless
  - 1- polycystic kidney (remove both kidneys)
  - 2- refluxing system (vesicoureteral reflux)
  - 3- Glomerulonephritis (steroid  $\rightarrow$   $\uparrow$  hypertension, mf.)

- Immunosuppression  $\Rightarrow$  some form of immunological control is necessary unless  $\bar{t}$  absolute histocompatibility as in donation from identical twins  $\rightarrow$  The agent used include cortison, cyclosporin A, antithrombotic globulin, azathioprine.

### \* complication of renal transpl. :-

1. Rejection :- immune "chronic" & vascular "acute".
2. acetabular necrosis.
3. Urinary tract obstruction.
4. renal infarction.



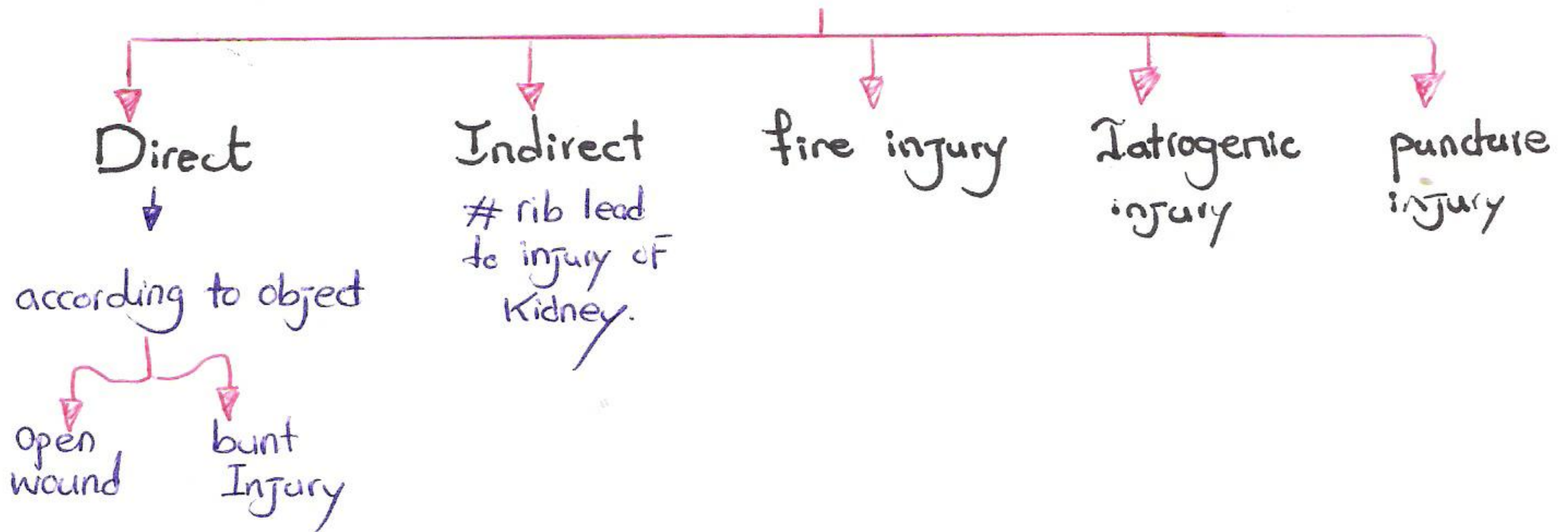
دا خالد ميلاد

## Urological Trauma.

Eman.G.D  
إيمان الغريانه

## Renal Injury..

divided according to mechanism &amp; cause of Trauma :-

\* pathology of Injury :-

- ① Bruising & echymosis (Most common)
- ② Subcapsular haematoma b/c Intact capsule
- ③ cortical tear
- ④ Medullary tear
- ⑤ corticomedullary tear.
- ⑥ Avulsion of pole of kidney.
- ⑦ Avulsion of whole kidney.

**BLUNT Injury**

- Car accident
- if slight trauma → Bruising due to injured capillary → Oozing of blood to Interstitial tissue Multiple Micro Haemorrhage (contusion to kidney)
- C/p :- Microscopic haematuria  
pain at site of trauma
- ttt: conservative watchfull of closed renal trauma.



## \* management:

→ Conservative watch Full of closed renal trauma

- take blood sample for CBC & cross match
- Insert I.v canula
- Keep pt under observation → regularly regularly according to severity of trauma
  - morphin analgesia
  - Antibiotic to prevent infection of haematoma
- I.vu, CT scan to assess contralateral kidney function..

In Sever trauma → Laceration in Barynchyma without Laceration of capsule → haematoma.

laceration in barynchyma & capsule → Bleeding in perirenal fascia.

Cortical tear: perinephric haematoma

No need ttt Except conservative

Medullary tear: blood get out to calycesis → clot formation →

clot pain →

C/p: bruising

Tenderness - Gardén?

Cortico medullary tear:

- Extravasation of blood & urin  
urin which Exit from kidney fill the pelvis → which occupied by blood clot → ↑ intra-renal pressure → extravasation of urin  
→ ↑ uremia → b/c reabsorption of other kidney excreted..

C/p: • loin mass  
• loin pain  
• haematuria

O/E: loin mass (perinephric haematoma)  
Gradual Enlargement → Expanding Haematoma  
may lead to Shock (to prevent it give blood transfusion)



Investigation: Ivu to show presented other Kidney & Function of it

ttt: **Conservative** if failed do Exploration. (trans peritoneal approach)  
 ttt according to:

- 1- traumatic renal tissue → debridement
- 2- haematoma → Evacuation
- 3- Small tissue → Suture.
- 4- Avulsed one pole → partial Nephrectomy
- 5- Avulsed Kidney → total Nephrectomy provided that other Kidney Functioning.

bealy & laves 6- wound is packed firmly with gauze to stop bleed  
 in hope to some renal function retain

### Sharp Injury.

- if directed to pleura → lead to pneumothorax  
 ttt by surgical exploration & suture wound in diaphragm of Kidney.
- if directed to GUT → may cause infection  
 explor wound & ttt injured viscera by suture

### Gun SHOT

- (a) low speed → as effect of penetrating injury (Knife)
- (b) high speed → have high risk of Infection b/c -ve pressure follow high velocity bullet → septicemia & death..

ttt: by debridement of Necrotic tissue  
 drainage or Evacuation of haematoma

**Iatrogenic** if surgeon injured renal artery → if not corrected Nephrectomy is Indicated.



## \* Indication of Surgical Exploration:

- 1] persistent haematuria under conservative ttt
- 2] Expanding haematoma
- 3] perirenal infection
- 4] open wound.
- 5] associated intraperitoneal injury.

## Ureteric Injury

uncommon result from hyper-extension of open-injury.

\* 1] Caused by ① blunt trauma (rare) : b/c it is severe trauma found in post mortem.

② Sharp injury : by Knife or bullet → leakage of urine into peritoneal or iliac fossa → Reduction of urin volume.

ttt - Surgical Exploration  
- closure of wound  
- Tube drainage

③ Iatrogenic most common cause is surgical trauma during hystrectomy

- NB - pre-operative catheterization of ureter make them easier to protect during surgery.

ttt injury at time of surgery should be repaired immediately + per-cutaneous Nephrostomy.

→ if injury not Recognized at time of operation &  
- NO Symptoms → Ligation ureter → Atrophy of Kidney  
- Loin pain & Fever → pyelonephrosis  
- urinary fistule may develop

\* if bilateral obstruction → urgent nephrostomy & immediate surgery.

Immediate Nephrostomy Enter & repair ureter immediately or after 2wk then Reconstruct ureter.



## Bladder Injury

urinary bladder protected by pubic bone

(A) extraperitoneal rupture: caused by blunt trauma or iatrogenic.

- pathology: Urin Extravasation in pelvis
- C/P: suprapubic

① Suprapubic pain ② Desire to micturate.

- Investigation: ① CT scan

② Ivu confirm leakage

③ Retrograde cystography → confirm diagnosis

- ttt: ① Lower midline Laprotomy → Suture the wound
- ② Suprapubic or urethral catheter.

(B) Extra Intra peritoneal rupture:

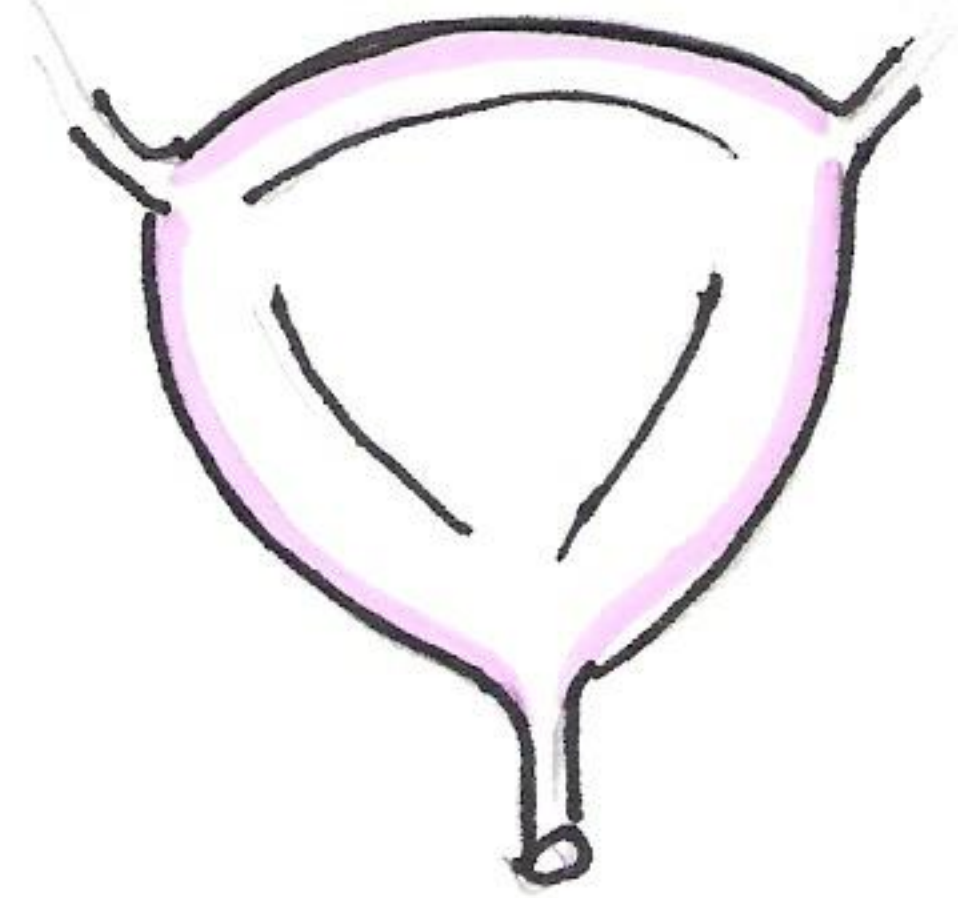
caused by blunt trauma on Full distended bladder  
urine extravasate to peritoneal cavity → chemical peritonitis →  
acute abdomen rigidity of Abdominal wall Muscle

C/P: sudden pain in hypo

May accompany  $\bar{e}$  shock

No desire to micturate

ttt: Exploration & drainage of urine From peritonium  
bladder & urethral catheter





## Urethral Injury

usually occur in butterfly fracture of pelvic bone

**N.B** In Butterfly Fracture there is rupture of Membranous urethra until provide otherwise.

rupture of membranous urethra → urin escap into perivesical retropubic space & haematoma Formation

C/P:- pain

dull on percussion (Above umbilicus)

urethral bleeding

urine Retension.

**ttt:** Restablish urethral convety:

→ if pt Micturate → Follow up

→ if pt Not Micturate → wait if not →

(a) Ascending urethrograme to confirm diagnosis

(b) Urgent Suprapubic cystotomy tube (Safe methode)

\* after 2-3 wk do ascending urethrograme to discover if there is stricture at site of healing

\* if there is stricture ttt by Reconstruction via → Trans urethral Incision  
Urethroplasty

\* Rapture bubar urethra:-

caused by blunt trauma to perineum.

\* C/P:- ① urin retention

② perineal haematoma

③ bleeding From External urethral meatus.

\* Mangment:- as Membraneous



\* Summary of management of renal trauma:

- Treat the shock with fluid & transfusion

- bed rest until hematuria resolve

- if persist bleeding → Lapratomy is indicated.

- in penetrating renal trauma → exploration →

- ✓ Laceration → sutured.

- ✓ collecting system → closed.

- ✓ urinary extravasation → drained.

- ✓ devitalized tissue → removed

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د/ خالد ميلاد ..

## uro radiology..

Eman.G. 😊

(1845-1923)

## - X-ray:

it is Electromagnetic wave (conrad Röntgen) 1898  
(In Germany.)

(1901 → Nobel prize.)

- plain Abdomen x-ray  
(conventional radiology)

↳ available / non invasive / easy / cheap.

① - Excretory urograph  
(IvU, I.v)⑨ - Cystography  
(McU)

② - Retrograde pyelogram

⑩ - urethrograph (ascending urethrograph)

③ - Percutaneous urograph  
(Nephrogram)

⑪ - retrograde urethrograph.

④ - Arteriography.

⑤ - Venography

⑥ - Vasography → ejaculatory duct.

⑦ - Computerized tomography (CT, MRI)

⑧ - Isotope scan → IBS, isotope renal scan.

## plain Abd. x-ray

called (KUB) → Kidney, ureter, Bladder film.

Normally not show any thing if there is pathology will show  
the defect as stone, dilated kidney ... ect.

(Radio-opaque shadow)

N.B: psoas Muscles shadow is seen in normal x-ray  
if disappear mean (there is pathology)Should be start with it b/c: Simple, cheap, available,  
Non invasive..



**Excretory urography:-** (Ivu, Ivp) intravenous urogram, intravenous pyelogram

I.v.u: injecting iodine-containing contrast material intravenously & taken serial x-ray to demonstrate Renal pelvis & calyces, the Rate of Kidney emptying, the caliber of ureters & Bladder outline. Once the Bladder emptying filled a post Micturation film will demonstrate bladder emptying & the amount of Residual urine.

Indication:

- 1 Urolithiasis
- 2 hydronephrotic change in Kidney
- 3 Lower urinary tract abnormality (bladder)
- 4 Malignancy (Renal or Bladder)
- 5 cyst
- 6 Evaluation of lower UTI & obstruction

**N.B** Limitation of it is use b/c  $\rightarrow$  Toxicity to Renal system b/c allergy to contrast media.

**N.B** Not Indicated In Trauma

Contraindication:-

- 1 Contrast medium allergy (by History)
- 2 Renal impairment Function
- 3 pregnancy in 1st trimester
- 4 Multiple Myeloma. /thyrotoxicosis.
- 5 Drugs: NSAIDs & diabetic drugs  $\rightarrow$  b/c  $\uparrow$  nephrotoxicity  $\rightarrow$  contrast medium  
 $\rightarrow$  stop 3 days before IVP

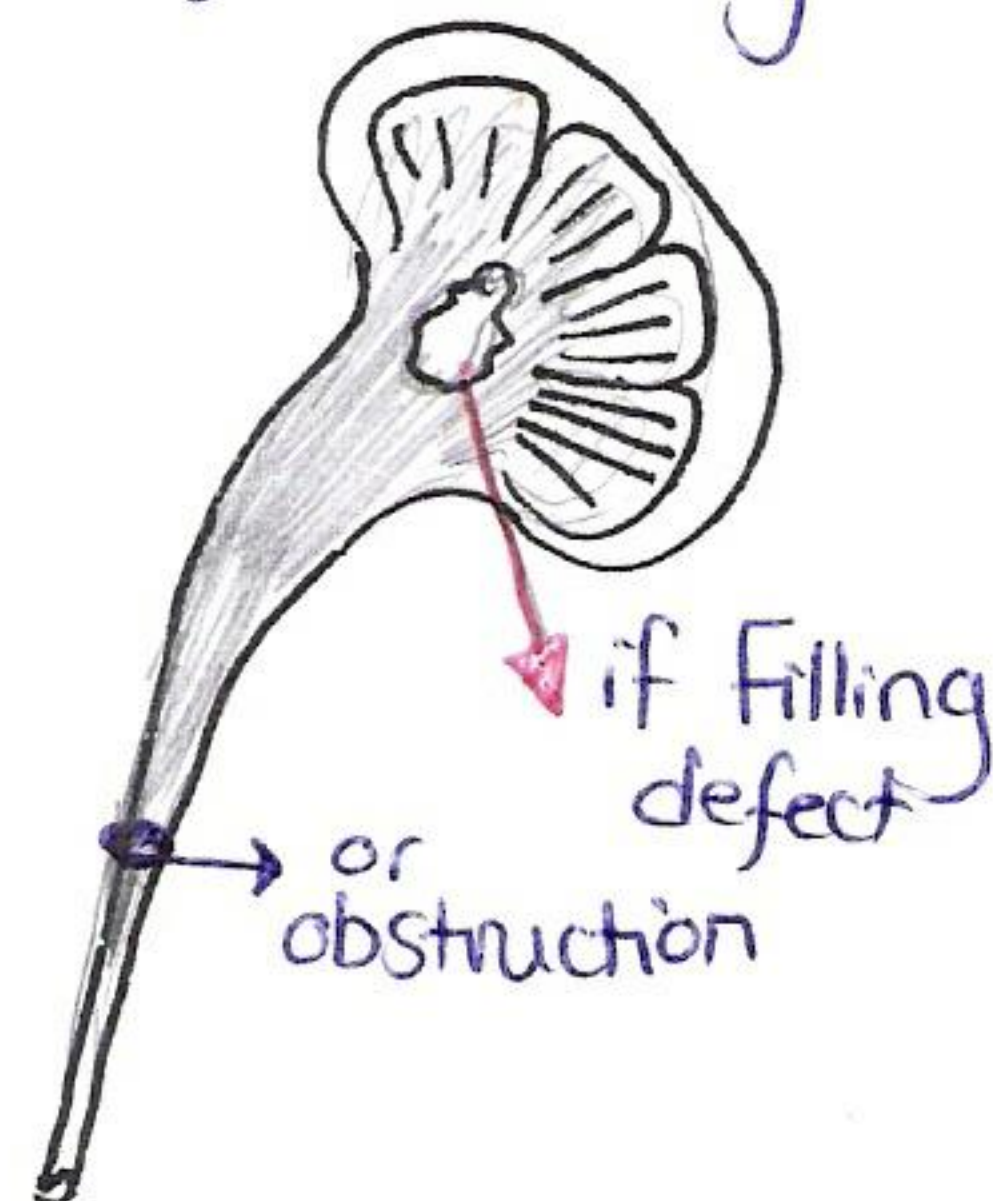
**N.B** it is morphological study to Kidney & some sort of Functioning Kidney b/c Excretion of Medium by time.

**Retrograde pyelogram:-**

Indication:

- 1 obstruction at urether.
- 2 vesico-urethral Reflux **REFLUX**
- 3 **NON**-Function Kidney

do under cystoscopy vision in theater.





## per-cutaneous urograph (Nephrogram)

as diagnostic and therapeutic  
inject medium into kidney by needle to show the pathology  
of Reching & do a Nephrostomy tube...  
to protect kidney function to pass urin out by pass  
obstruction.

Absolute Indication of nephrostomy tube:-

- ① Pyonephrosis
  - ② obstruction
- } if not → may loss pt  
due to septic shock, loss of kidney  
function...

## Cystogram:

introduce catheter to bladder & inject medium  
to give diagnosis of Bladder pathology AS Trauma.  
associated with pelvic fracture.

Indication:-

- ① bladder injury
- ② Contraindicated cases of Ivu.

## Mcu:

Micturating cysto-urethroscopy.

for vesico uretric Reflex  
post uretro valve.

## Ascending Retrograde urethrography:

used only in ♂  
inject dye through urethra  
& fill bladder..

\* Indication.

- ① Stricture urethra
- ② Trauma (very strong indication)

→ Show funnel shape prostatic urethra in urethral  
stricture...

- Arteriography do renal embolization in surgical removal  
of Renal tumor or in Angiomyelolipoma b/c it's  
highly vascular.



## Venography

Indication: ① in advanced renal tumour infiltrate to IVC

\* it's invasive procedure  $\rightarrow$  enter through femoral vein

\* Restricted use after MRI appear.

## Ultrasonography

( $\uparrow$  temperature of scanned organ by  $1^\circ$  at time of scanned.

- need experience, Available, 1st Line of diagnosis.

## Radio Isotope Scan:

[a] Isotope Bone Scan

$\rightarrow$  to detect any metastasis as in case of prostatic cancer.

[b] Renal Isotope Scan.

$\rightarrow$  use DTPA to test renal function.  
if  $<15\%$  Function Kidney

$\rightarrow$  DEMSA

it's morphological study as reflux.  
Renal Scar.

[N-B] DEMSA is a good Diagnosis for renal scar.



**CT scan**

\* X-ray  $\rightarrow$  have all hazards of ionizing radiation

\* Staging of Tumour:  
more helpful in solid Tumour

\* Diagnosis of urolithiasis by helical spiral CT scan  
Even radiolucent stone as uric acid..

Need I.V contrast Medium or oral contrast Medium

(N.B)

CT Scan with contrast is diagnosis for renal Injury

Limitation are narrow range of view..

CT Angiography } with contrast  
CT urography }

**MRI**

Not X-ray: detect H<sup>+</sup> ion resonance in cells.

more helpful in soft tissue

detect body fluid, blood  
UTI as contrast no need contrast medium.

MRI angiography }  
MRI urography }  
without contrast

(N.B) MRI with contrast media called Gadolinium which is low nephrotoxicity.

Contraindication of MRI:

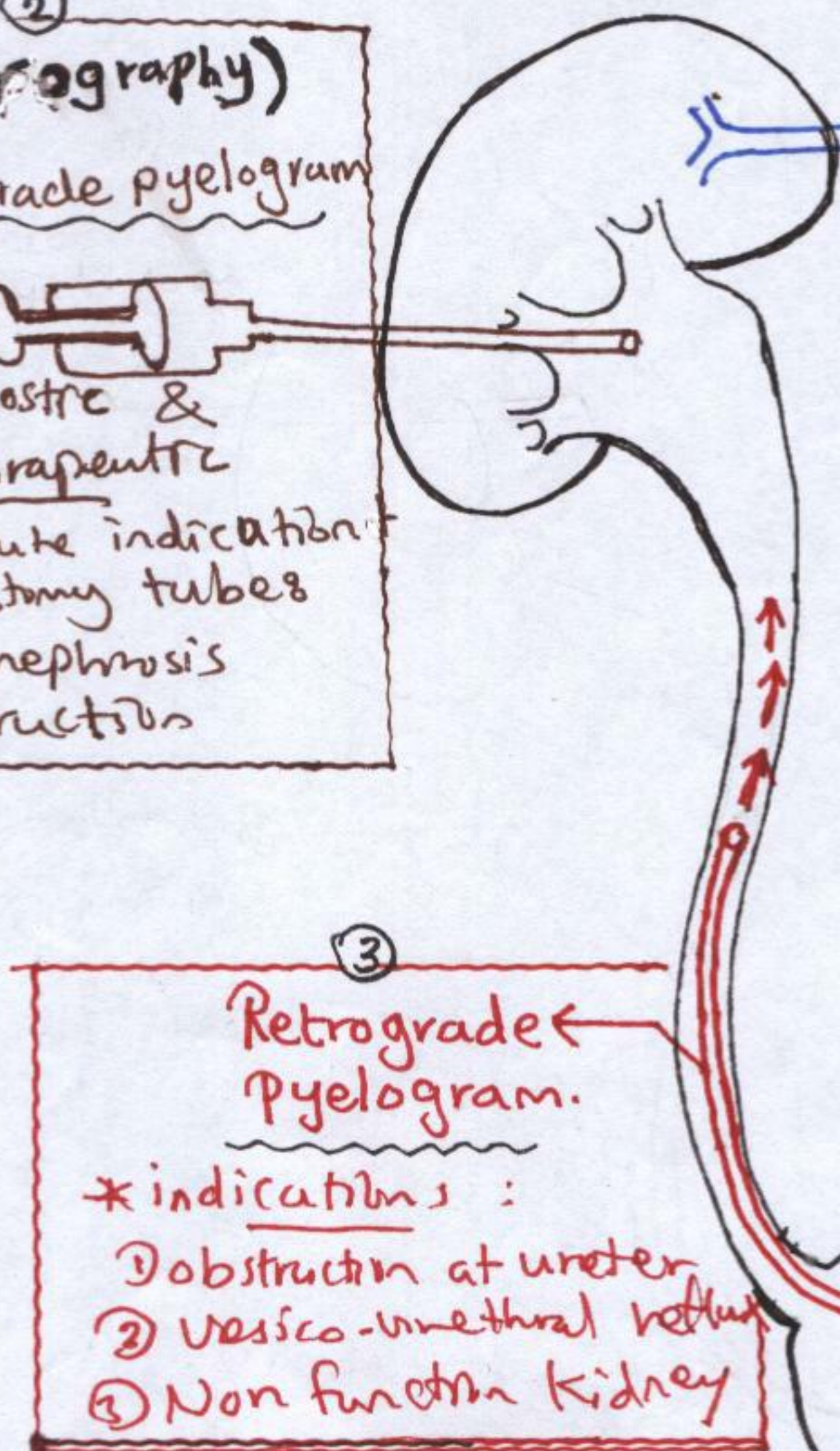
- ① Metal implant
  - ② Intracranial clips
  - ③ Intra-ocular clips
  - ④ pregnancy.
- (N.B) Metal implant: e.g ferromagnetic substance

Titanium is non ferro-mag.  
Not C/I For MRI



# Uro-radiology

②  
(PC Urography)  
- Antegrade pyelogram  
Diagnostic & therapeutic  
\* Absolute indication of Nephostomy tubes  
① Pyonephrosis  
② Obstruction



① → IVU  
\* Indications :  
① Urolithiasis  
② hydronephrotic change in kidney  
③ lower urinary tract abnormality (bladder)  
④ Malignancy (Renal or bladder)  
⑤ Cyst  
⑥ Elevation & lower UTI & obstruction  
\* C/I :  
① Contrast medium Allergy  
② Renal impairment function  
③ Pregnancy in 1st trimester  
④ Multiple Myeloma / thyrotoxicosis  
⑤ Drugs: NSAID & diabetic drugs.

③ Retrograde Pyelogram.  
\* indications :  
① Obstruction at ureter  
② Vesico-urethral reflux  
③ Non function kidney

④ Cystogram  
\* indication :  
① Bladder injury  
② C/I Cases of IVU

\* indication :  
① Stricture urethra  
② Trauma (very strong indication)  
⑤ ascending retrograde urethrography

⑥ MCU

• for vesico-urethric reflux.  
• post urethro valve.



د/ خالد ميلاد

## Catheterization

Eman.Gy. ☺

## \* Types of urinary catheter

- ① urethral catheter
- ② supra pubic catheter
- ③ ureteric catheter
- ④ double J catheter
- ⑤ Nephrostomy tube catheter

## Urethral catheter

Types: 8-

A Self retaining

Ballon → Hematuria cath.  
2 way cath.  
3 way cath.

non ballon

B non self retaining.

\* Indication: (to empty bladder)

- ① acute, chronic, clote retention (most common indication)
- ② post-operative in urological study → to enhance healing of U.B.
- ③ pre-operative in pelvic surgery
- ④ Comatose pt & ICU → to evaluate urine output  
(Normal 30-60 mL/H)
- ⑤ For installation of chemotherapy
- ⑥ Neurogenic bladder
- ⑦ Renal failure

Ballon self Retaining catheter.

- a 2 way catheter: way for drainage of urine  
way for Inflation & deInflation of ballon contain valve.
- b 3 way catheter: as 2 way catheter.  
way for Irrigation of bladder or instalation of therapeutic.
- c Hematuria catheter: it is lax catheter b/c weak wall of the bladder due to wash & suction prussure → lead to damage of bladder wall..



**[N.B]** catheter Formed of ~~fo~~ foulet lax or silicon b/c less toxic

✖✖ **Foulet Lax:** Keep 1 month as maximum time

✖✖ Normal caliber of catheter written on it 20 princh. if divided by 3 produce External diameter of catheter in mm.

✖✖ **Capacity** of balloon writtin on it.

✖✖ balloon Filled with steril saline but not air b/c air obstruct urin outflow.

### Insertion of urethral catheter:

Under complete aseptic Technique  
Cleaning of genitalia,

Slow insertion of catheter - if there is obstruction  $\rightarrow$  stop insertion  
after insertion should be sure it is bladder by inflation  
of ballon & keep the catheter

### Complication of catheter:

**[A] during insertion:** ① infection  
② Trauma & bleeding when inflation  
of ballon before insertion.

**[B] ① Enhance UTI** b/c that we give pt plenty of fluid.  
to wash out bacteria

② Egg-shape Apperance  $\rightarrow$  if the catheter present for  
long time with high  $Ca^{2+}$  concentration in urin precipitate  
on ballon with infection lead to Stone formation

**[C] When Remove the catheter:**

- ① Trauma to urethra
- ② Trauma to bladder Neck

**✖ contraindication:**

- ① Bleeding per urethra
- ② Trauma or urethra injury

do For Him Supra-pubic  
catheter



## Supra. Pubic catheter

\* Cystotomy → Open → via surgery  
closed → percutaneous

### \* Indication:

- [1] Failure of urethral catheter
- [2] Contra indication of urethral catheter
- [3] Long term catheterization
- [4] urethritis, prostatitis which is Contra indication of urethral catheter.
- [5] Bleeding or Trauma of urethra.

### Insertion:

- \* under Aseptic Technique
- \* Shaving pubic hair
- \* Clean with Normal Alcohol
- \* Local anaesthesia → Two Finger print Above <sup>pubic</sup> in  
midline → (skin - subcut. tissue - appenurosis - rectus ms separation)
- \* Insert catheter → Inward - downward - Backward

[N.B] Bladder should be fully to insert catheter easily.

[N.B] Supra pubic catheter is Silicon catheter.

## ureteric catheter

\* Indication: - Only diagnostic (to visualization of upper urinary tract)  
Cystoscope used to insert ureteric catheter  
16 cm → every Mark 5cm

[N.B] ureteric catheter is radio opaque



## Double-J catheter

30cm long tube.

### \* Indications: (Therapeutic)

- ① to pass obstruction
  - (a) intraluminal obstruction
  - (b) Extraluminal obstruction as Tumour, pregnancy
  - (c) Intra Mural obstruction.
- ② prophylactic in ESWL (Extracorporeal shock wave Lithotripsy) to prevent stone street.

**NB** it is pain relievable pass urin with out effect of stone fragment in ureter.

\* insertion under complete aseptic Technique.

## Nephrostomy tube or catheter

### \* Indications:

#### (a) Diagnostic:

1 pt with renal problem for antegrade urography & Retrograde urography.

2 Measure pressure in pelvis

#### (b) Therapeutic:

1 Obstructed Kidney **COMMONEST** Indication

**NB** → urgent Nephrostomy In acute Renal obstruction.

### CONDOM catheter:

Indication: ① pt cant walke  
② pt with urinary Incontinence.



دا خالد سيلاد

## Congenital Anomalies

EMAN.G. (15)

### Renal Anomalies

Renal Agenesis absent of kidney may be unilateral or bilateral  
 can detected by :-  
 - u/s → absent  
 - cystoscopy → to show orific of ureter if one or two in bladder at trigon area if Hemitrigon indicated Agenesis  
 Ivp → absent

NB Kidney Formed From wilfernduct then descend to pelvis

Hypoplasia of Kidney: it is small kidney  
 can detected by Ivp or u/s  
 Very difficult to detecte if congenital or Acquired due to chronic attack of pyelonephritis so should be tack history if there H/O upper UTI  
 renal artery also small so carry risk for Renal HTN  
 Not control by Medication so Need Nephrectomy

Multicystic Kidney discussed before.

Simple Solitary cyst:

def: It is unilateral single cyst

Aetiology as Multicystic Kidney.

(Not presented renal Failure b/c it is unilateral)

NB: can be Diagnosed by u/s but should be do CT scan to exclude renal tumour



\* pathology

- \* involve lower pole of kidney and produce symptoms if → cyst about 10 cm in diameter while if larger than 10 cm — In diameter while if large it (enough to feel in flank contain Amber fluid cyst in blue & thin wall)
- about 5% of this cyst contain haemorrhagic fluid about half (1/2) of them have papillary cancer on their walls usually superficial but some of them is deep & when aspirated it very difficult to separate from parenchyma has no communication & renal pelvis
- (by urography appear as filling defect so need U/S - CT scan - MRI)
- to differentiate from other

\* clinical picture:

- ① pain in flank (intermittent if bleeding sudden distended cyst wall so pain become sudden & severe.)
- ② Note Mass at Flank
- ③ physical examination usually Normal
- ④ Micro haematuria is rare.

Investigation:

- ① plain film (expansion in kidney shadow)
- ② Excretory urogram:  
(Dx of cyst need 1-2 min after infusion of radio-opaque fluid visualized parenchyma become white while the space occupying cyst dense)

**(N.B)** if routine urogram failed to opacity of urogram parenchyma significantly infusion nephrograph should be done to ↑ contrast b/c vascular renal tissue & cyst ~~is~~

- ③ CT scan. is most accurate to differentiate cyst from renal tumour with contrast b/c some tumour is avascular



## Renal cyst:

approximately that water cyst with thin sharply demarcated wall from renal parenchyma usually Renin unaffected.

## \* Fusion of Kidney Horse shoe or cake or lume.

It is considered as Ectopic

C/P:

- Most cases Asymptomatic Excepte if develop obstruction.
- Sign: renal Mass  $\bar{e}$  horseshow palpable at lower spine
- Complication: ① Hydronephrosis  
② Stone  
③ Infection

## Ectopic Kidney:

Failed Field of Kidney to descend to normal proper side

May lie over pelvic brim or in pelvis

lead to Miss Dx

- Complication:
- 1- Obstruction
  - 2- stasis
  - 3- Infection.



## Ureter Anomalies

Function of ureter  $\rightarrow$  carrying urine from kidney to bladder so any congenital anomaly or pathological problem interfere with function of it  $\rightarrow$  back pressure  $\rightarrow$  Hydronephrosis

### Type:

- ① Complete absent or ureteral Atresia or end blindly
- ② Duplication of ureter
  - May complete or Incomplete
  - More common in O<sup>r</sup> Male

### \*\*\* INCOMPLETE TYPE: (Y TYPE)

- is caused by branching of urethral bud before it reaches Metapelvic blastema.
- Some times reach out side sphincter b.c ureter not open in proper side (Trigonal area)

ttt: Uteropyelostomy

Most of them is Asymptomatic

May diagnosis by I.V.P.

- ④ Urti
- ⑥ Uretrocele.



Duplication

one ureter

## Urethral Anomalies

① Stricture

② Hypospadias: urethral Meatus open on ventral side of penis proximal to tip of Glans penis

\*\*\* Type:

- ① Glandular
- ② Coronal
- ③ peno scrotal
- ④ perineal

About 70% of cases are distal penial or coronal

ttt Surgical Hypospadias or Epispadias Repair..



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## ⊕/⊕ of Frank Haematouria:

- (if blood is clot)
- 1 Malignancy (Transitional cell carcinoma)
  - 2 Stone
  - 3 INFection
  - 4 Trauma

## ⊕/⊕ of colourless urine:

- 1 Renal Failure
- 2 diuretic use

## ⊕/⊕ of dark urine:

- 1 obstructive Jaundice
- 2 Dehydration.

# URIN EXAMINATION

## A) PHYSICAL

- 1 Color → colorless
- 2 Apperance → clear
- 3 specific gravity (1010-1018)  
if low CRF if High → concentrated urine

## B) CHEMISTRY

- 1 pH → 5.5-6.5 acidic  
if Alkaline Indicated INFection with proteus, Klebesila.
- 2 protein → NO
- 3 Glucose → NO
- 4 Ketons → NO
- 5 Nitrate →
- 6 Haemoglobin → NO
- 7 Myoglobin →
- 8 Leucocyte



### (C) MICROSCOPIC

- ① WBC Normal  $< 3$  (pus cell  $\rightarrow$  pyuria)
- ② RBC
- ③ Cast indicate degeneration of proximal convoluted tubules  
2 TYPE OF CAST
  - $\rightarrow$  Hyaline (present in cortex)
  - $\rightarrow$  Red (present in Tubules)
- ④ Gvum
- ⑤ parasite
- ⑥ candida
- ⑦ Crystals (urea +  $\text{Ca}^{2+}$  oxalate) + cystin + phosphate)
- ⑧ YEAST

**[D] BACTERIOLOGY:**

## Culture in MaKonky Media

Number of colonies  $10^5$  (common cause is E. coli)

## [E] HORMONES:

- ①  $\alpha$ -Feto protein
- ② Metabolic of catecholamine IN PHAEOCHROMOCYTOMA is (VMA)
- ③  $\beta$ -HCG



# ANATOMICAL REVIEW

## KIDNEY

- The two kidney lie on post. abd. wall on sides of the vertebral column
- The Lt kidney is higher ( $\frac{1}{2}$  inch) than the Rt (due to liver).
- The kidney is about 4 inch (long), 2 inches (wide), 1 inch (thick)
- The kidney has two ends:

upper end (pole)  $\rightarrow$  related to suprarenal gland.

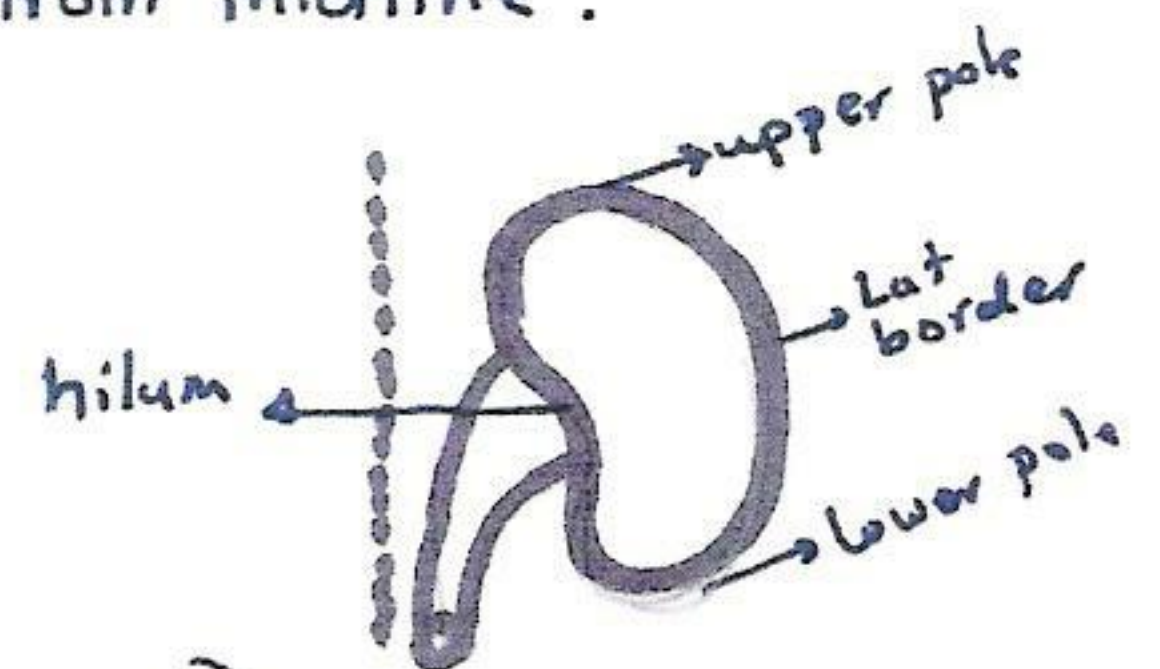
lower end (pole)  $\rightarrow$  pointed & slightly away from midline.



- The kidney has two surfaces:  
anterior surface & posterior surface.

- The kidney has two borders:

Lateral border & medial (which has hilum on it).



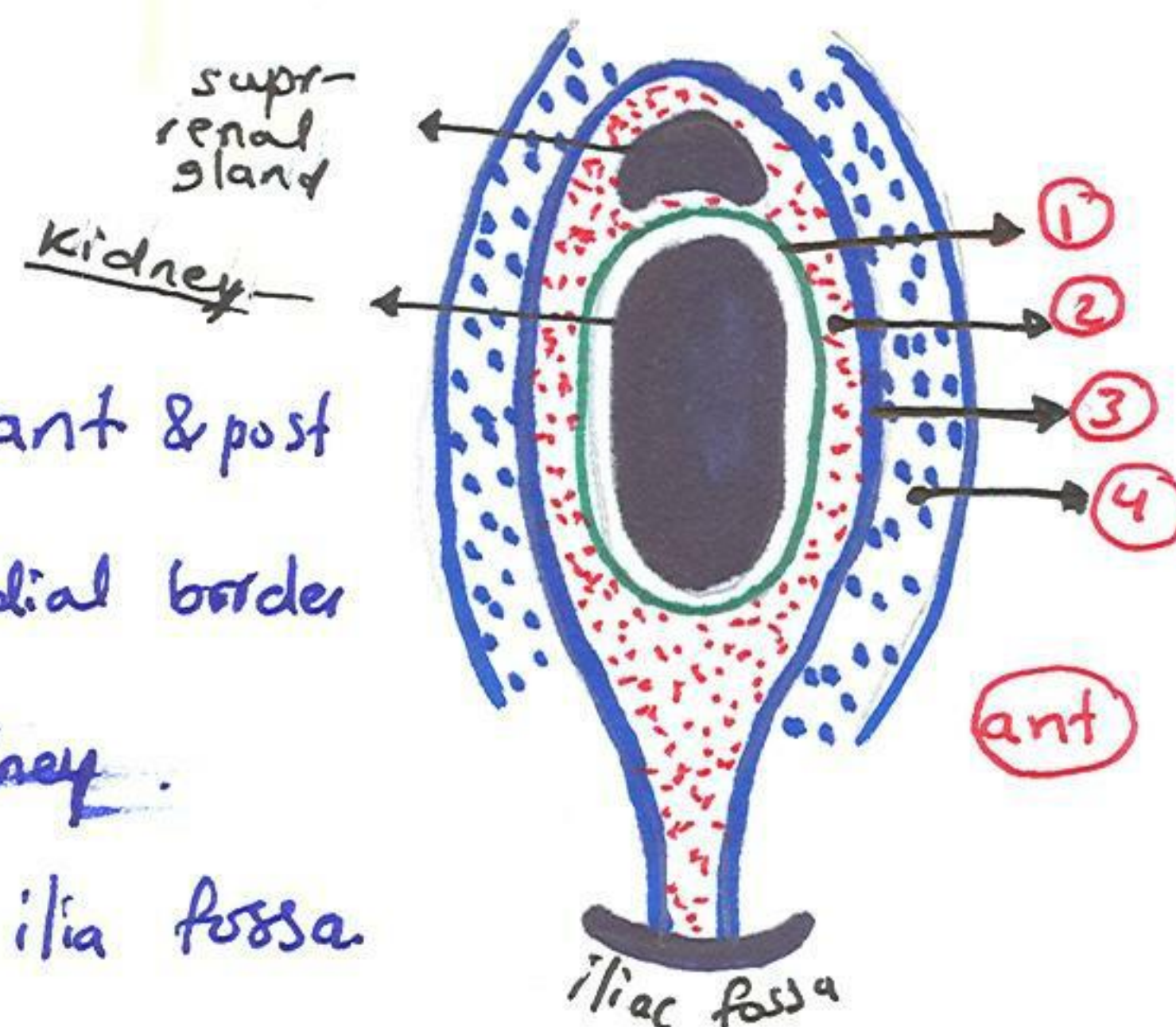
- \* - The hilum gives passage to:

- Renal vein (anterior)
- Renal artery (middle)
- Pelvis of ureter (posterior)
- Nerves & Lymphatic



— The kidney is surrounded from inside to outside by

- ① Fibrous capsule.
- ② Peri-renal fat.
- ③ Renal fascia : consist of 2 layers ant & post and closed above & medial border & lateral border of kidney.  
— it's attached below to iliac fossa.
- ④ Para-renal fat.

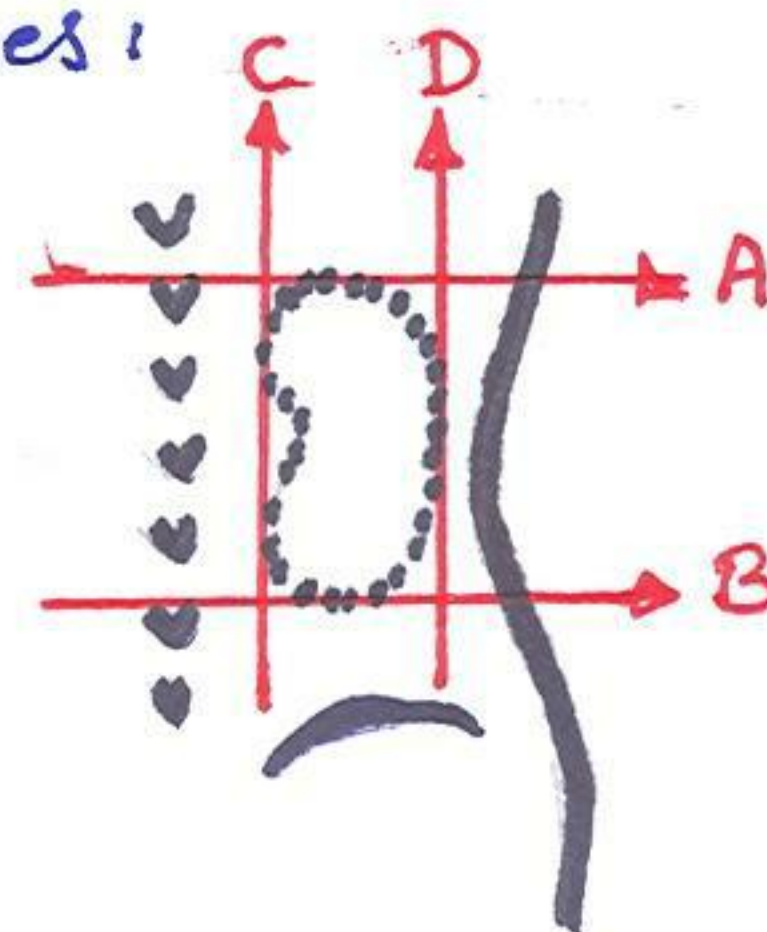


### \* SURFACE ANATOMY :

— from posterior view:

— Kidney is drawn between 2 vertical & 2 horizontal planes:

- (A) upper horizontal : at level of 11<sup>th</sup> thoracic spine.
- (B) lower " " " " 3<sup>rd</sup> Lumbar " "
- (C) Medial vertical line : 1 inch from median plane.
- (D) Lateral " " : 3 " " " " "



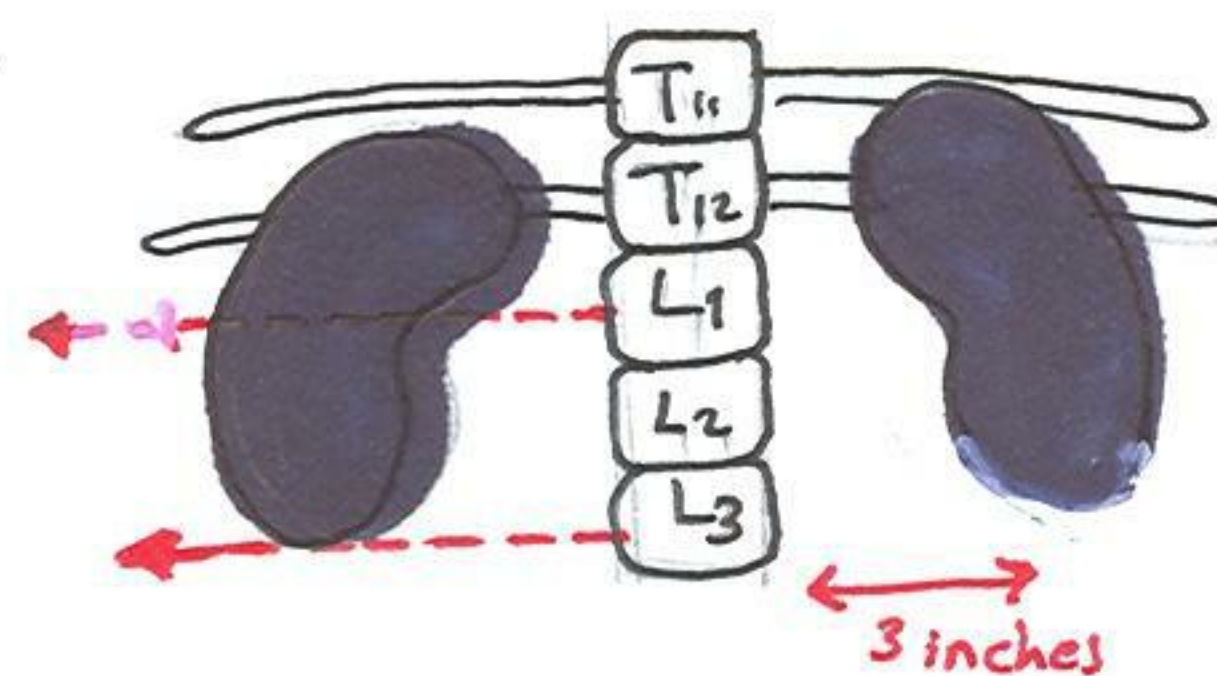
— from anterior view:

— Hilum \* lies at L<sub>1</sub> (transpyloric plane)  
(Rt kidney lower by 1/2 inch)

— Upper pole reaches 11<sup>th</sup> rib (the Rt

Kidney reaches 11<sup>th</sup> I. Costal space) & it's 1 inch from midline.

— lower pole reaches level of L<sub>3</sub> & is 3 inches from midline.  
(subcostal plane)





## \* RELATION :

### ● POSTERIOR RELATION :-

\* Kidney is related posteriorly to :

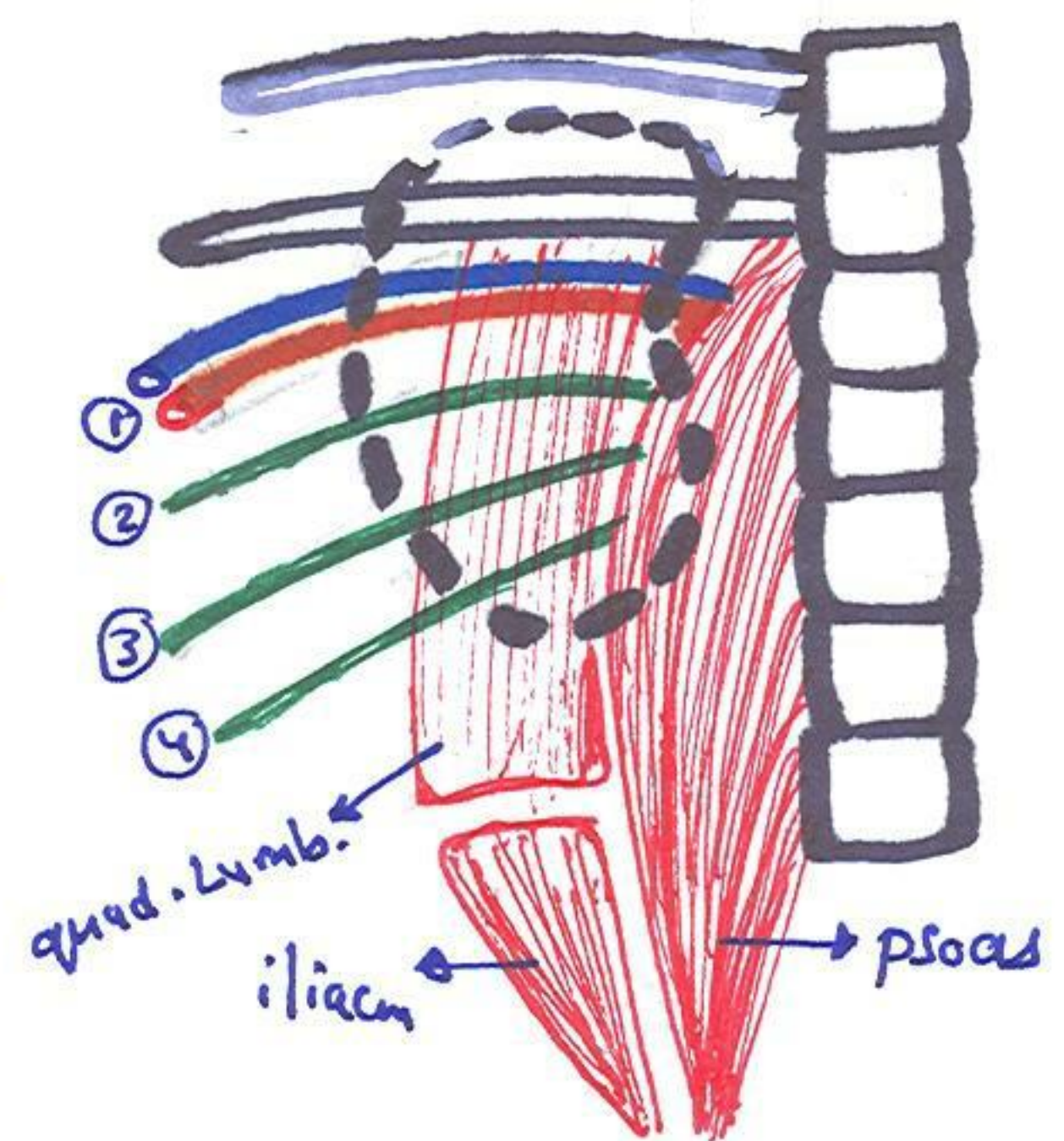
- 11<sup>th</sup> rib, 11<sup>th</sup> intercostal space & 12<sup>th</sup> rib.

((the Rt Kidney is lower & don't reach the 11<sup>th</sup> rib)).  $\Rightarrow$  separated by diaph.

- Psoas major, quadratus lumborum & transversus abdominis muscles.

- above the quadratus there is :

- Subcostal vessels<sup>①</sup>, subcostal nerve<sup>②</sup>, iliohypogastric<sup>③</sup> & ilioinguinal N.<sup>④</sup>



### ● ANTERIOR RELATION :-

\* Rt Kidney : ① Rt suprarenal gland.

② Small intestine.

③ Rt colic flexure.

④ Liver (Rt lobe).

⑤ Duodenum (2<sup>nd</sup> part)

\* Lt Kidney : ① Lt suprarenal gland.

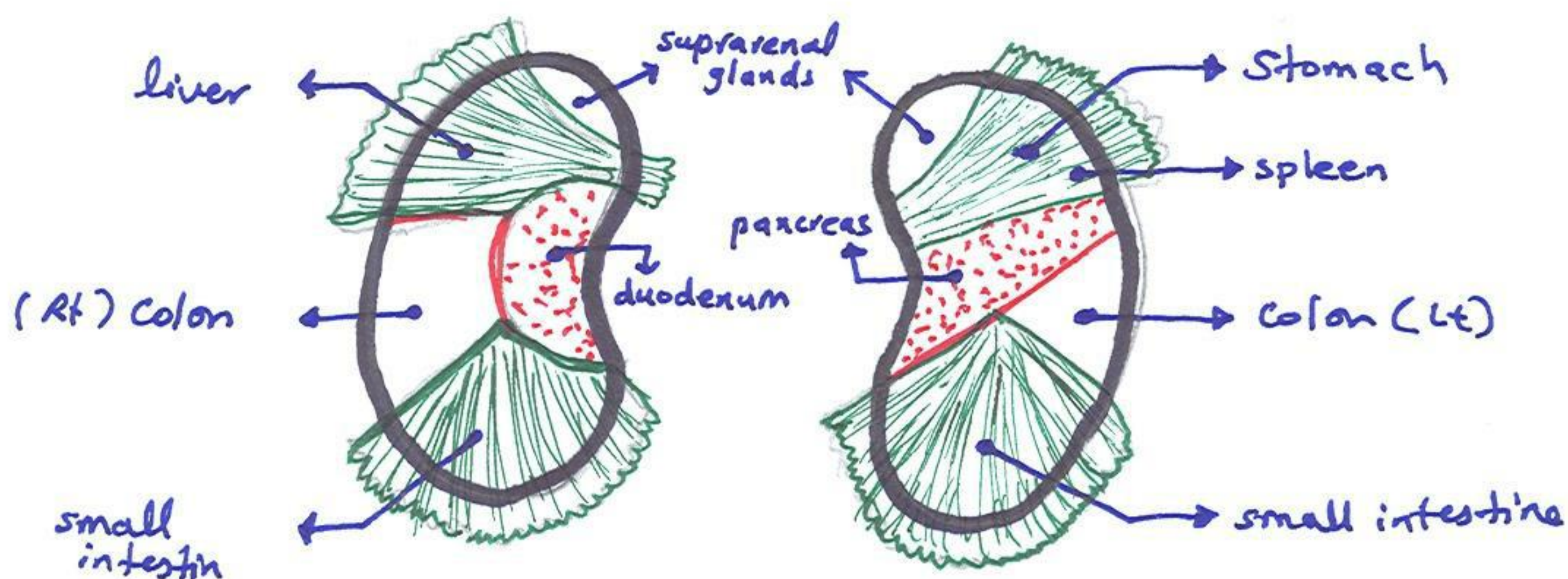
② Small intestine.

③ Lt colic flexure.

④ Stomach.

⑤ pancreas (body).

⑥ spleen.





## \* **PERITONEAL COVERING** :

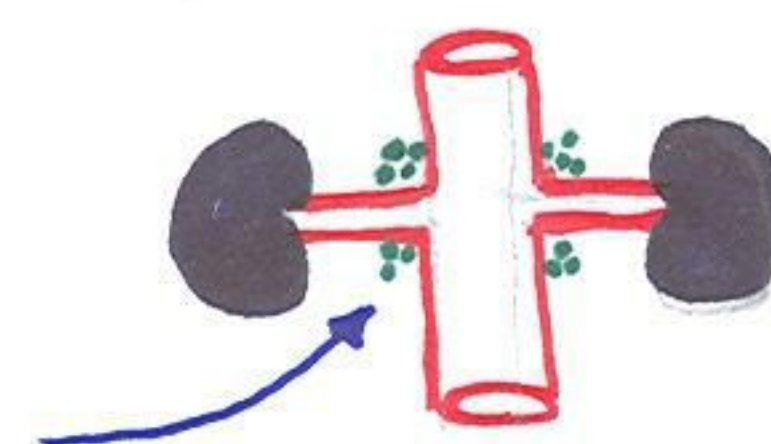
- The kidney is a retroperitoneal organ.
- The Rt kidney has (anteriorly) peritoneal covering derived from small intestine & liver.
- The Lt kidney has (anteriorly) peritoneal covering derived from small intestine, stomach & spleen.

## \* **BLOOD SUPPLY** :

- **ARTERIAL** :- from :-
  - Renal artery: branch of abd. aorta at the level of upper border of (L2) vertebra.
  - accessory renal a :- (in 30% of people) from aorta just above or below renal artery.
- **VENOUS** : to renal veins which drain into inf. vena cava.

## \* **LYMPHATIC DRAIN** :

- To lateral aortic L.N (around origin of renal artery)

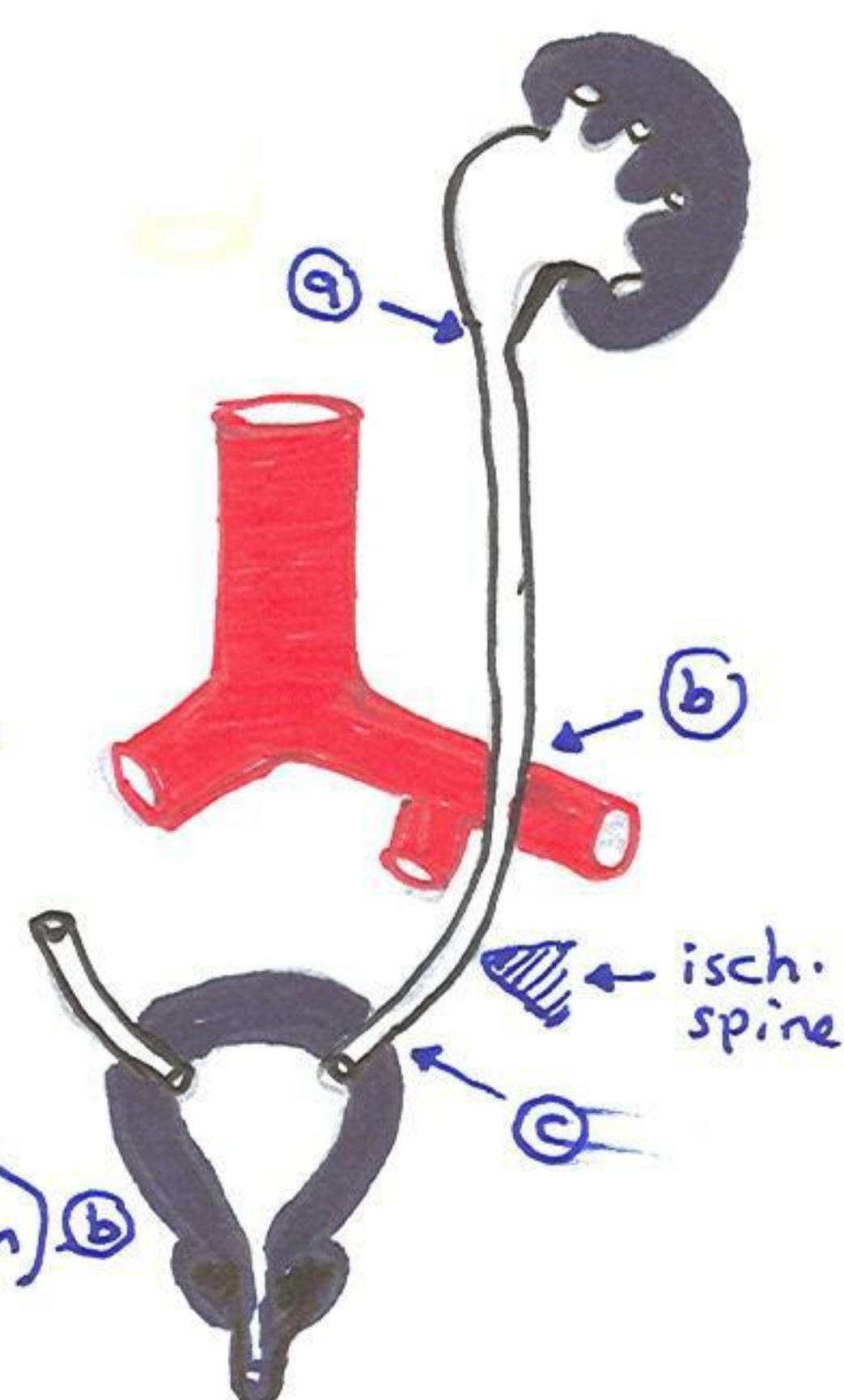




# URETER

## \* DESCRIPTION :

- The ureter is 10 inches (25 cm) long, half of it in the abdomen proper & lower  $\frac{1}{2}$  in pelvis.
- The ureter is divided into 3 parts:
  - ① abdominal part.
  - ② pelvic part (after crossing common iliac artery).
  - ③ intramural part (inside wall of urinary bladder).
- The ureter has 3 constrictions:
  - ①- At pelvi-ureteric junction. (a)
  - ②- At crossing of common iliac artery (at pelvic brim) (b)
  - ③- Intramural part (narrowest portion).



## \* COURSE :

- The ureter starts as a continuation of renal pelvis (at lower border of kidney) and runs at ant. surface of Psoas major (retroperitoneal) then enters the pelvis by crossing the beginning of the external iliac artery.
- Then the ureter runs backward, downward along the lower border of internal iliac a till the ischial spine where it curves forward & medially to enter the postero-superior angle of bladder.



## \* RELATION:

I. POSTERIOR: the 2 ureters are related posteriorly to:

- psoas major & minor<sup>(a)</sup> and genito femoral N.<sup>(b)</sup>
- Ext. iliac artery<sup>(c)</sup> & vein<sup>(d)</sup>
- obturator N.<sup>(e)</sup>
- obturator artery<sup>(f)</sup> & vein<sup>(g)</sup> (respectively)

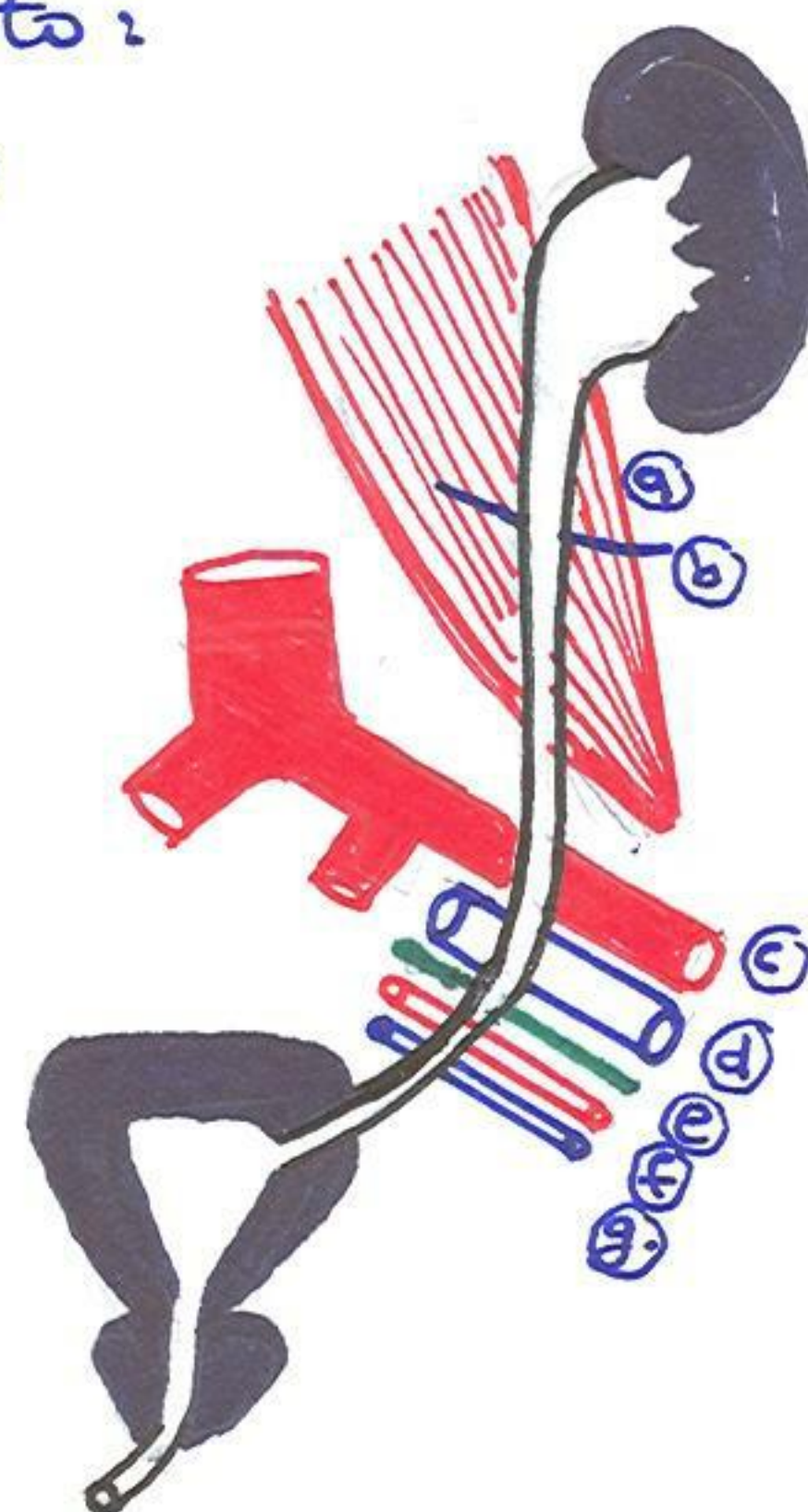
II. ANTERIOR:

Rt ureter

- ① Third part of duodenum & root of mesentry.
- ② gonadal vessels
- ③ Rt colic a
- ④ ilio colic a
- ⑤ ileum (terminal part)

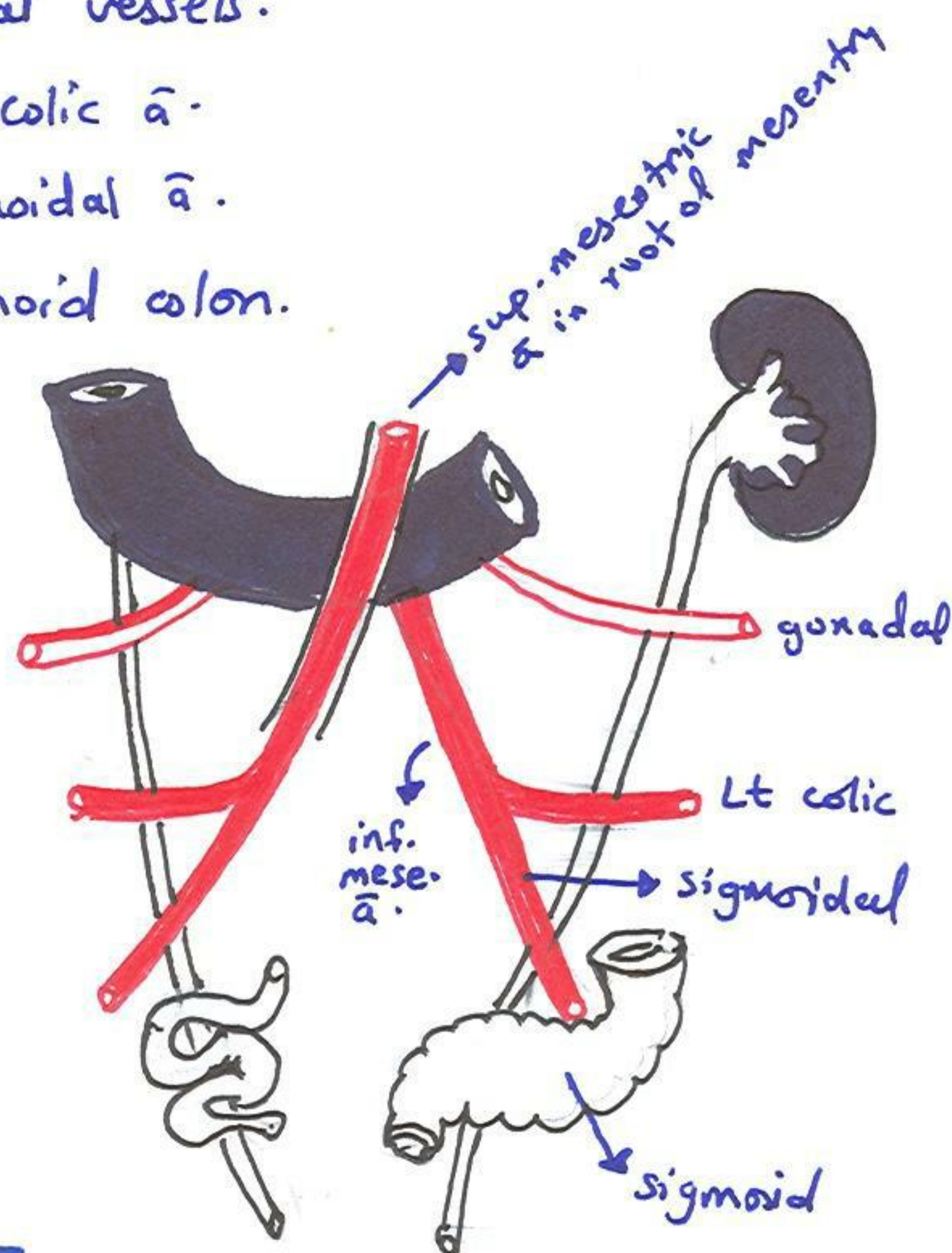
Lt ureter

- ① gonadal vessels.
- ② Lt colic a.
- ③ Sigmoidal a.
- ④ Sigmoid colon.



[NB] Both ureters are crossed in the pelvis by:

- vas deferens in male or
- uterine artery in female.

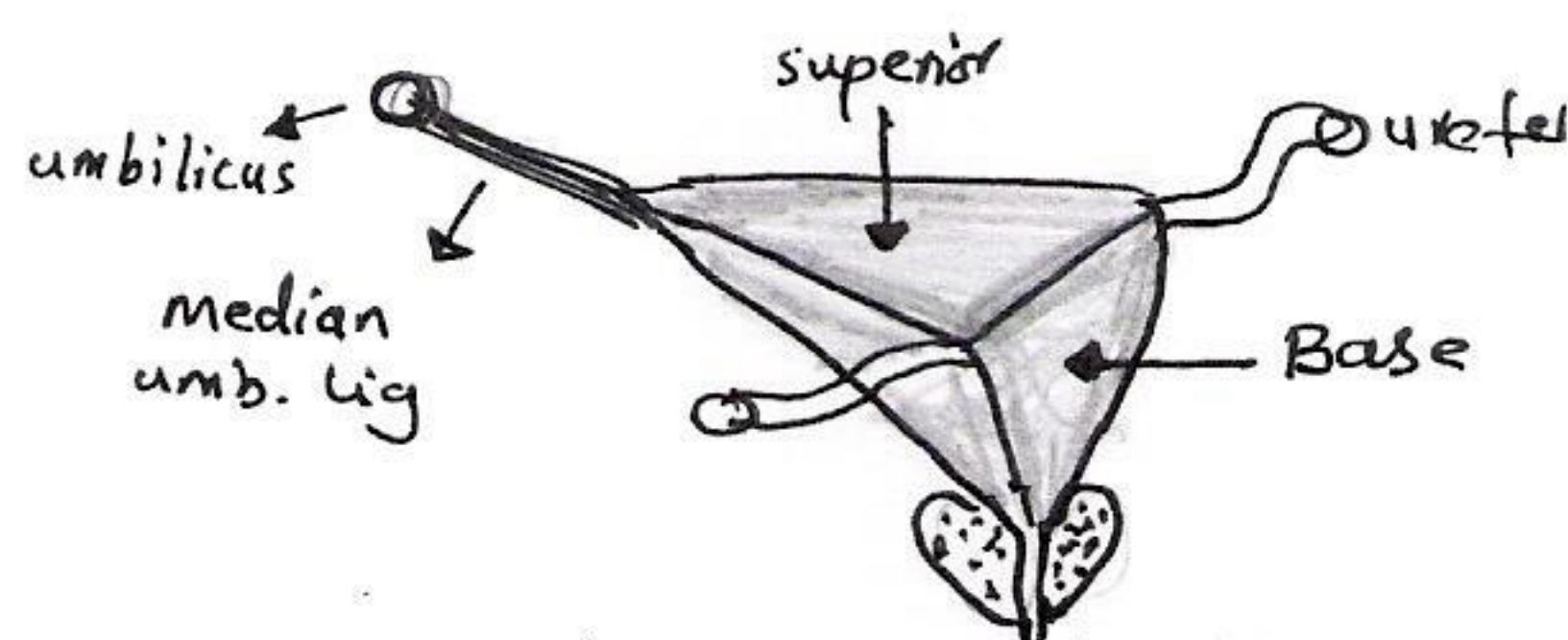




## \*\* URINARY BLADDER

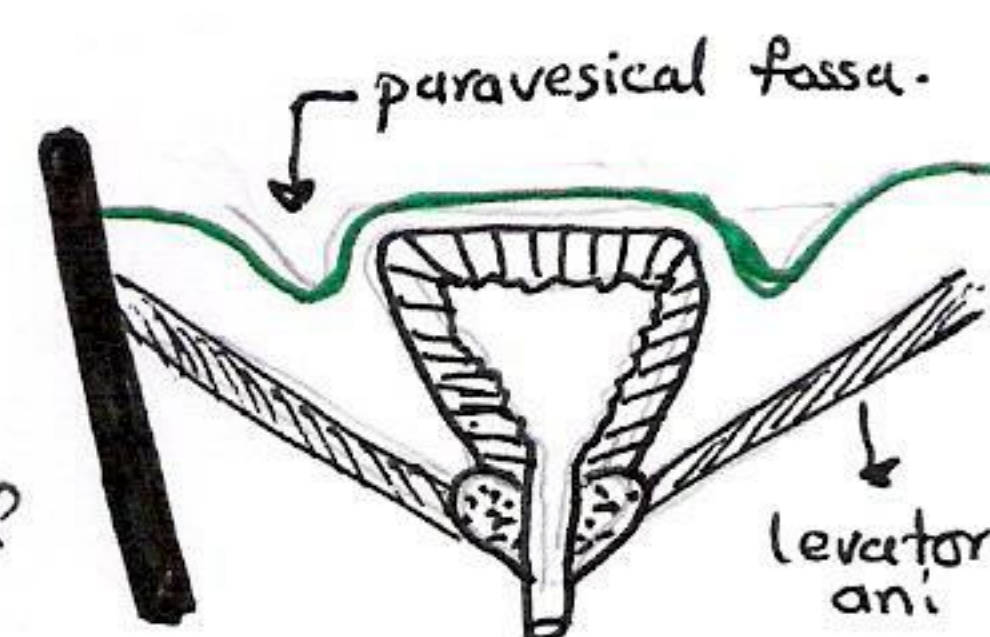
### DESCRIPTION:

- It's situated in the lower ant. part of pelvis.
- It's pyramidal in shape, composed of apex, base, superior, and 2 inferolateral surfaces.
- the base is situated posteriorly & the bladder rests on the neck inferiorly.



### PERITONEAL COVERING:

- In female, it's covered only at superior surface and the peritoneum reflected on the sides to form the paravesical fossa.

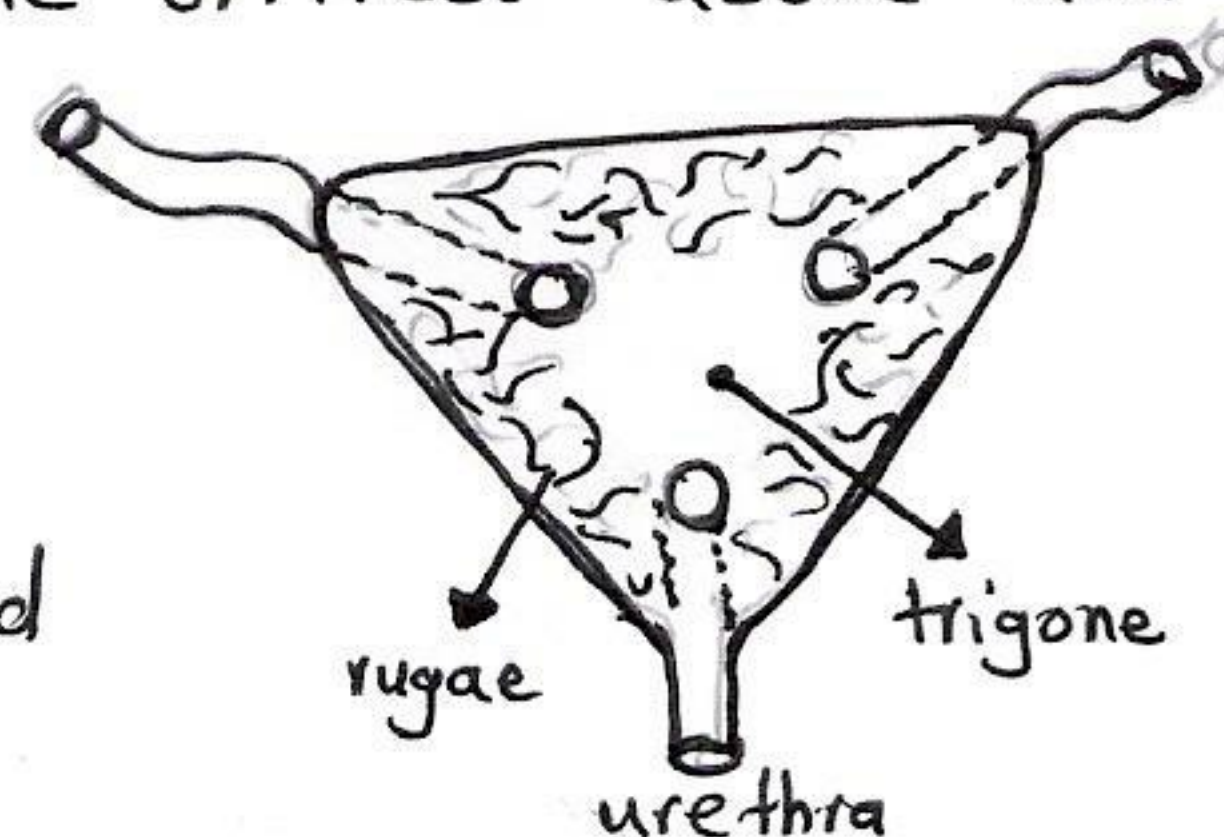


- In male covered from superior & uppermost of posterior surface, also forms paravesical fossae.

### N.B TRIGONE OF BLADDER:

is a triangular area of bladder mucosa at bladder base between 2 ureteric orifices above and internal urethral orifice.

- it's smooth, while the rest of mucosa is folded when bladder is empty and called the rugae.





## \* BLOOD SUPPLY OF URINARY B.

- ① superior vesical artery  $\rightarrow$  from umbilical artery.
- ② inferior vesical  $\bar{a}$   $\rightarrow$  from ant. division of int. iliac  $\bar{a}$   $\Rightarrow$  in male.  
- vaginal artery (instead of inf. vesical)  $\Rightarrow$  in female.
- ③ Branches from obturator & inf. gluteal arteries.

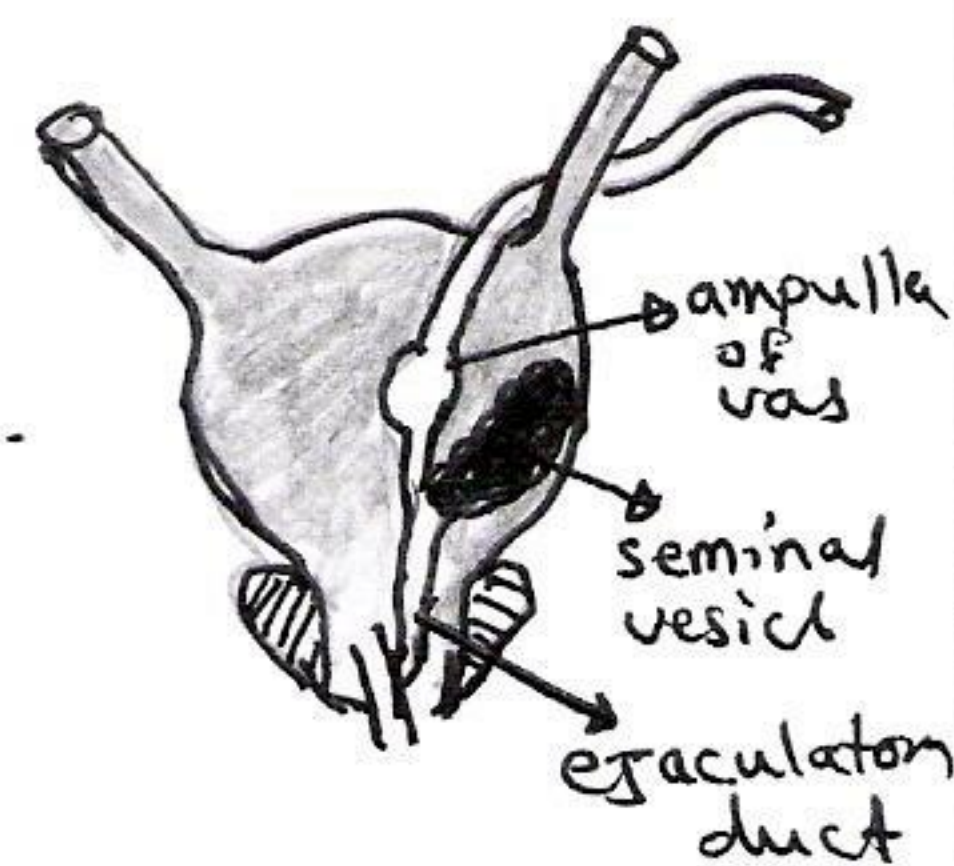
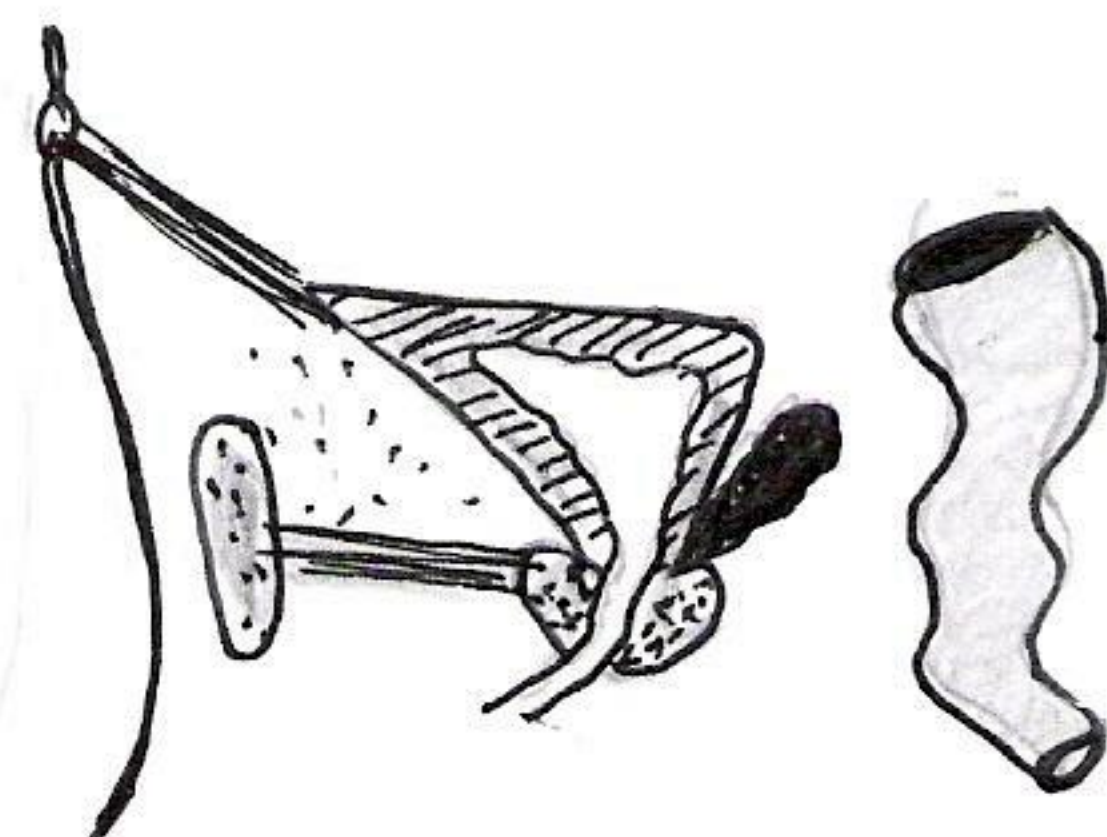
\* Veins forms plexus  $\rightarrow$  int. iliac vein

## \* LYMPHATIC DR.

Lymphatics drain into ext. iliac & internal iliac L.N.

## \* RELATION:-

- apex: related to symphysis pubis.
- Inferolateral:- levator ani, obt. internus.  
- obturator N. & vessels.
- posterior:- in ♀:- vagina (ant. wall) & cervix of uterus  
in ♂:- seminal vesicle, ampulla of vas & rectum.
- Superior: in ♀  $\rightarrow$  uterus & ileum.  
in ♂  $\rightarrow$  sigmoid colon.
- Neck continuous with urethra, in male it rests on prostate



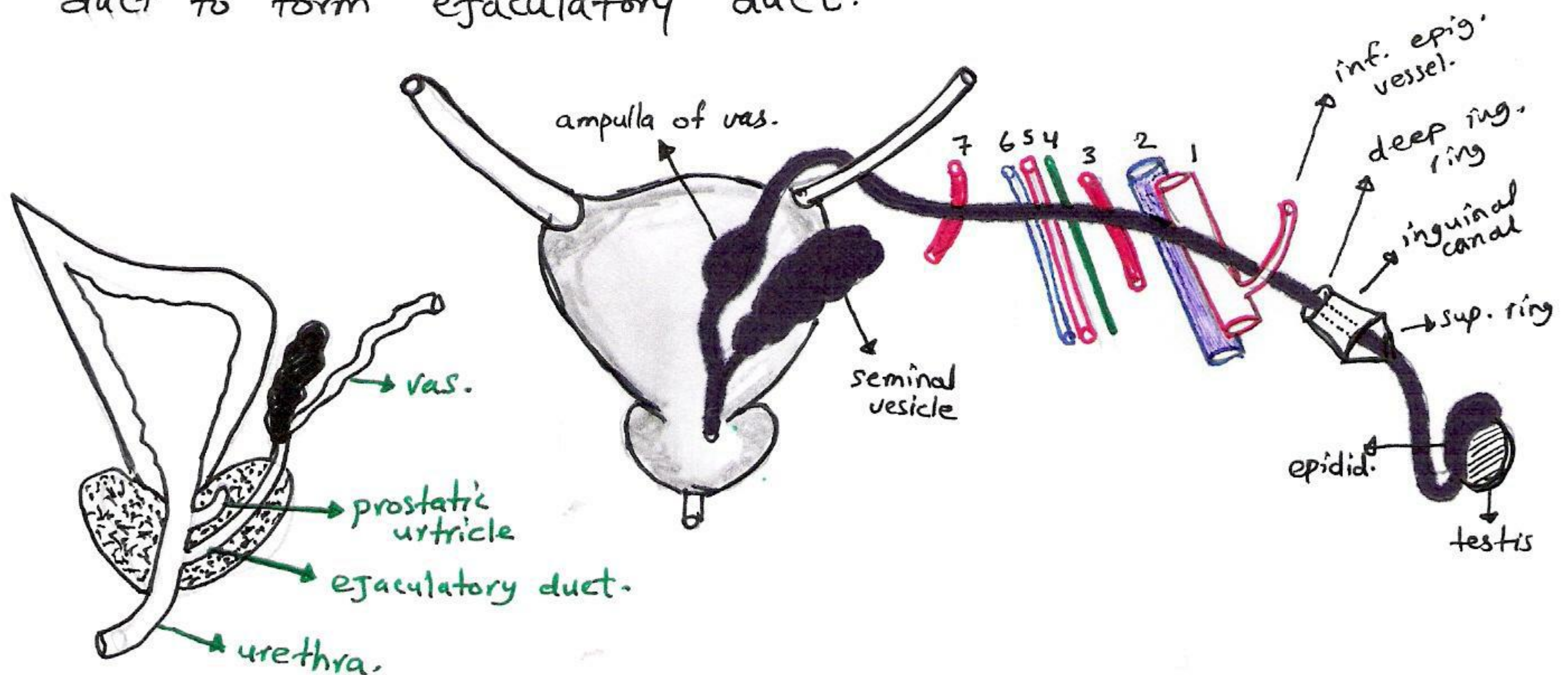
## \* NERVE SUPPLY:

- \* sympathetic:- from T<sub>11</sub>, T<sub>12</sub>, L<sub>1</sub>, L<sub>2</sub>.
- \* parasympathetic:- from pelvic splanchnic N. (S<sub>2-3,4</sub>).



## \*\* VAS DEFERENS :

-The vas (ductus) deference is a tube formed at the tail of epididymis and ends by uniting with seminal vesicle duct to form ejaculatory duct.



- The vas leaves the deep ing. ring & hooks on inf. epig. vessel and crosses the following structure in order:-  
ext. iliac a (1), ext. iliac vein (2), — umbilical a (3),  
obturator N. (4), obt. artery (5), obt. vein (6), inferior vesical vessels (7)  
and finally crosses the ureter.

\* SEMINAL VESICLE : sacculated sac (5cm X 1cm) & has duct at lower end that joins the vas deferens to form ejaculatory duct behind neck of the bladder

- the ejaculatory ducts open into prostatic urethra.



## \*\* FEMALE URETHRA :

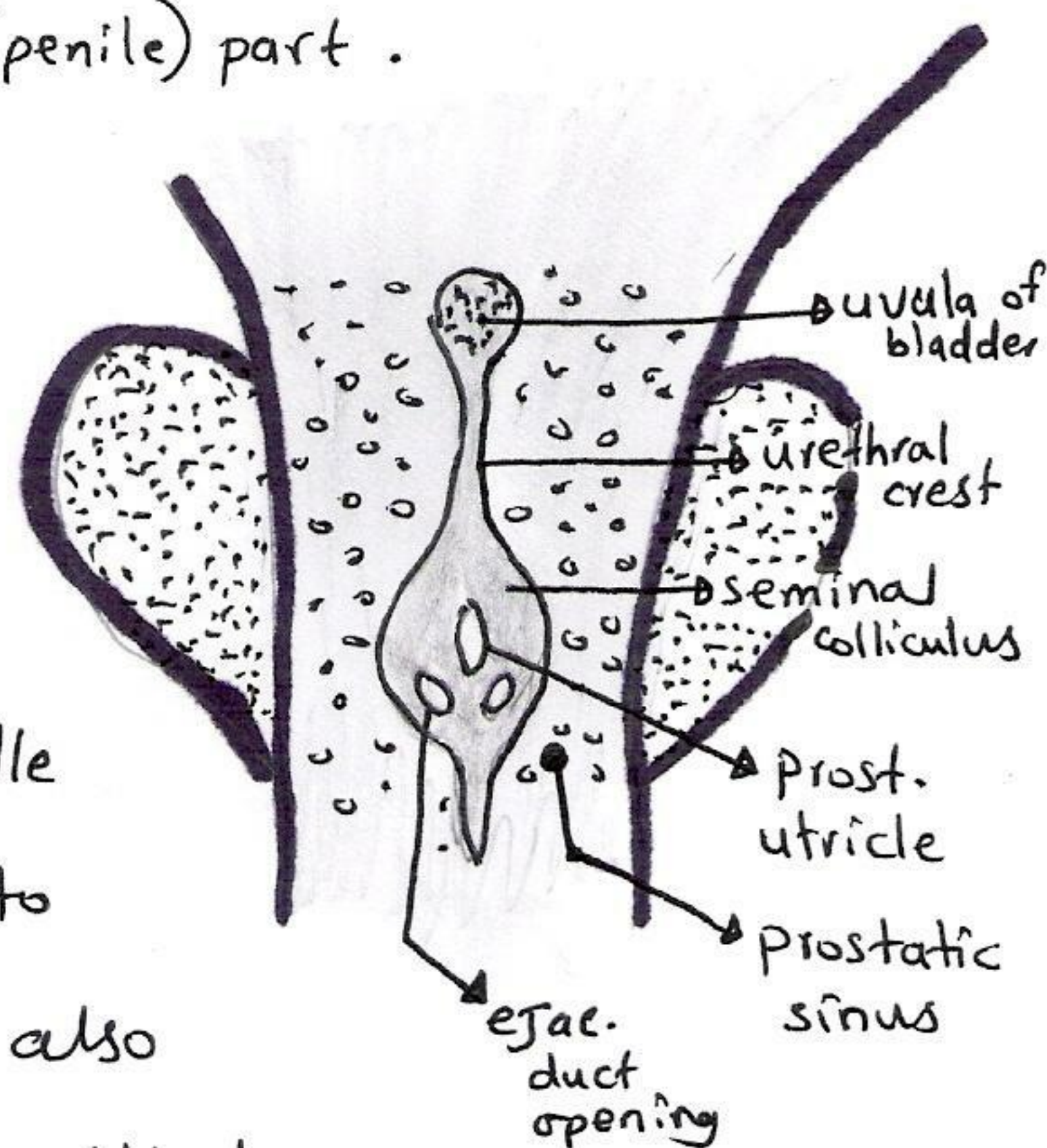
- It's 4 cm long, wider, shorter & more dilatable than ♂ urethra.
- It starts at bladder neck and descends downward, forward.
- It traverses deep & sup. perineal pouches & open into the vestibule (in front of vaginal orifice).

## \*\* MALE URETHRA

- It's 8 inches long (20 cm), divided into ① prostatic (1 inch), ② membranous ( $\frac{1}{2}$  inch) and ③ spongy (penile) part.

### ① PROSTATIC URETHRA :

- It's the widest, most dilated part.
- The mucosa posteriorly forms crest called urethral crest & on sides called urethral sinus & at its middle the crest form seminal colliculus into which the ejaculatory ducts opens also has a sinus projecting up & backward, blind pouch called prostatic utricle.
- the ducts of prostate open directly at prostatic sinus.



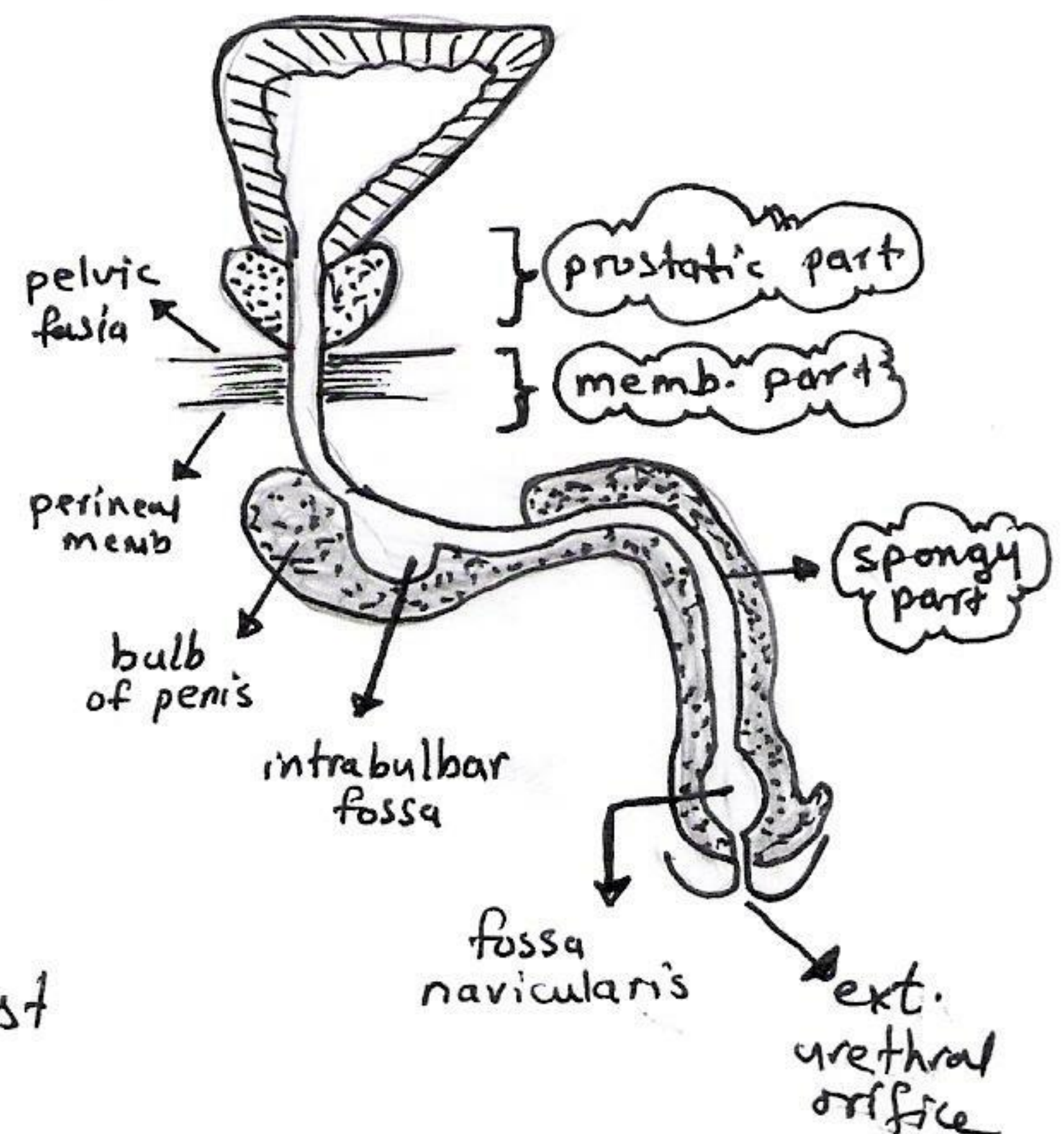
### ② MEMBRANOUS PART :

- narrowest, least dilatable part.
- It traverse the deep perineal pouch.
- It's surrounded by sphincter urethrae.



### 3] SPONGY (PENILE) URETHRA :

- The longest part of urethra.
- It enters the bulb of penis, and forms dilation called intrabulbar fossa.
- At its termination forms another fossa called fossa navicularis (or terminalis) which narrows to form ext. urethral orifice (narrowest point of all urethra).



**N.B.** the urethra has 2 sphincters:

- ① internal sphincter at its beginning (called int. urethral sphincter) and it's involuntary (supplied by symp. & parasymp.).
- ② External sphincter at membranous part (called ext. ureth. sph.) and it's voluntary (supplied by perineal br. of pudendal N.)

**N.B.** → membranous part is the most commonly injured part & urine escape into deep perineal pouch → sup. perineal P. → ant. abd. wall (deep to membr. layer of sup. fascia)

→ If spongy part injured, urine goes to → sup. perineal pouch → ant. abd. wall.



## PROSTATE GLAND

### DESCRIPTION :-

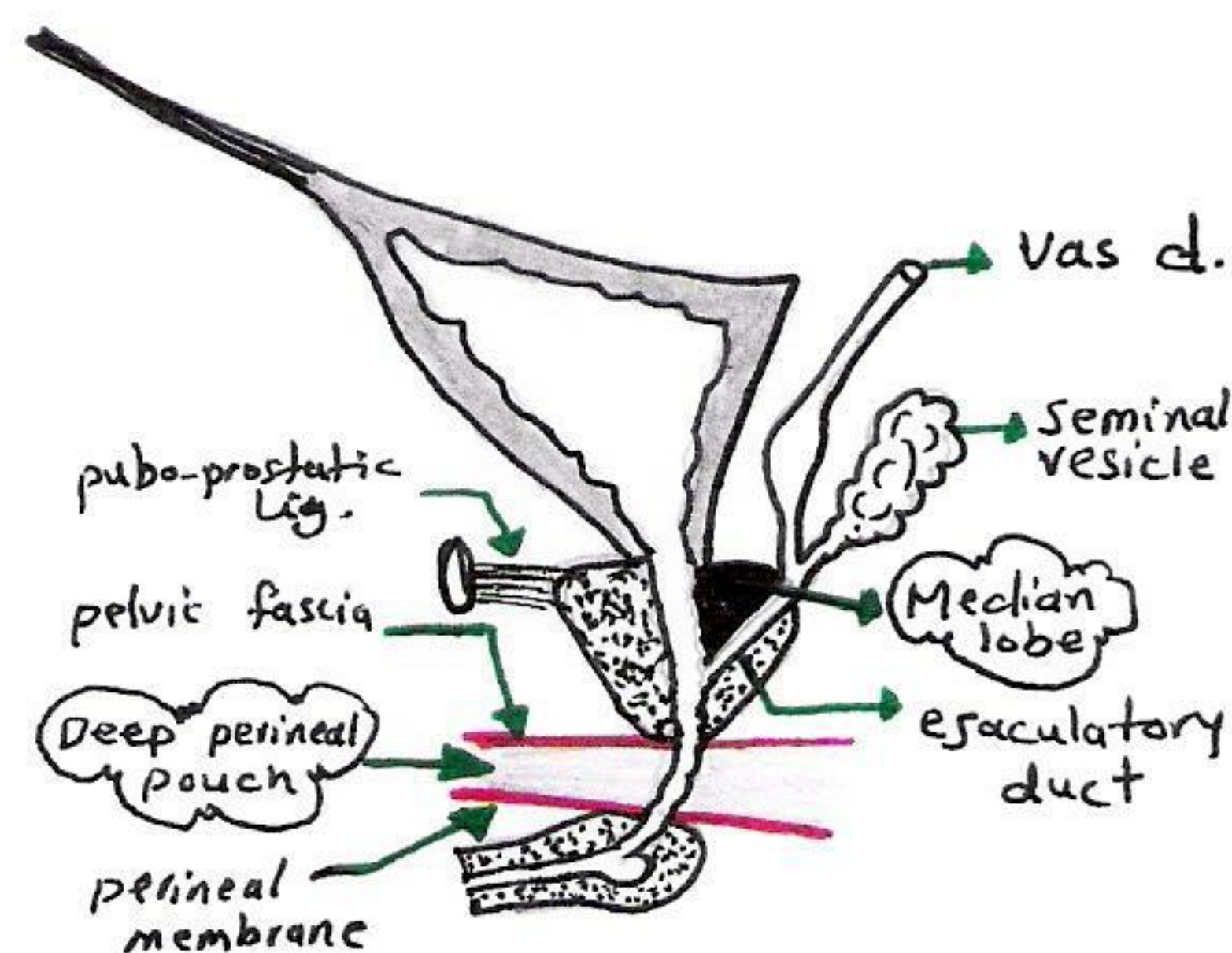
- It's a firm muscloglandular body that surrounds urethra in male, It's conical in shape having:

Base, apex, anterior, posterior & 2 inferolateral surfaces.

- The gland has 3 lobes:-

Median, Right & Left lobes

- Median lobe: between urethra and 2 ejaculatory ducts.



### BLOOD SUPPLY :-

- Arteries:- by [1] inferior vesical, [2] middle rectal, [3] int. pudendal.

- Veins :- forms a plexus which drain into internal iliac veins.

### RELATION :-

- Base:- (upward): related to bladder neck.

- Apex: (downward): " " pelvic fascia.

- Anterior surface:- " " symphysis pubis & puboprostatic ligament.

- Posterior surface:- " " rectum (pierced by ej. ducts).

- Infero Lateral " :- " " Levator ani muscles.

